AVIATION WEEK

JUNE 29, 1953

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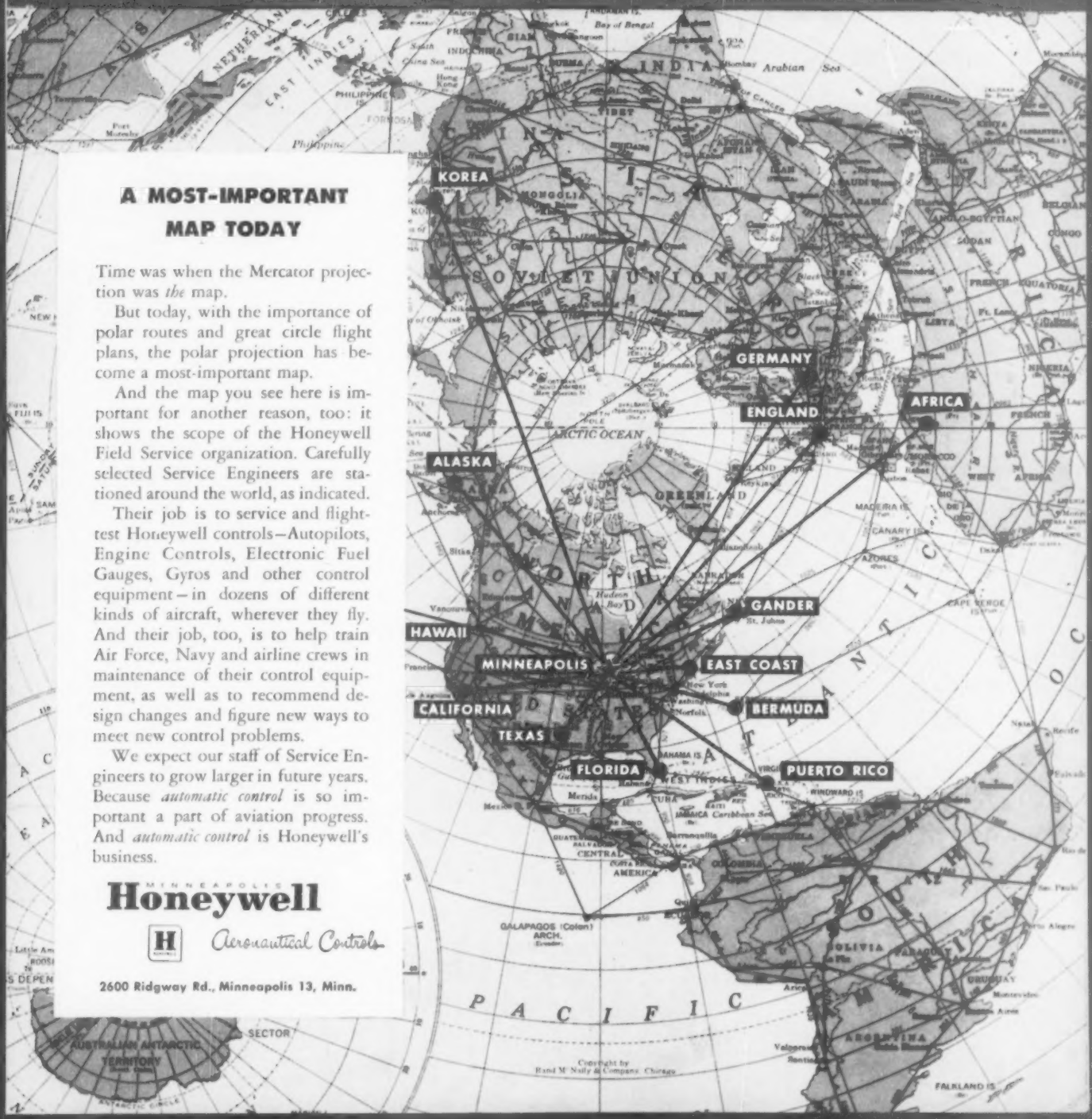


A MOST-IMPORTANT MAP TODAY

Time was when the Mercator projection was *the* map.

But today, with the importance of polar routes and great circle flight plans, the polar projection has become a most-important map.

And the map you see here is important for another reason, too: it shows the scope of the Honeywell Field Service organization. Carefully selected Service Engineers are stationed around the world, as indicated.

Their job is to service and flight-test Honeywell controls—Autopilots, Engine Controls, Electronic Fuel Gauges, Gyros and other control equipment—in dozens of different kinds of aircraft, wherever they fly. And their job, too, is to help train Air Force, Navy and airline crews in maintenance of their control equipment, as well as to recommend design changes and figure new ways to meet new control problems.

We expect our staff of Service Engineers to grow larger in future years. Because *automatic control* is so important a part of aviation progress. And *automatic control* is Honeywell's business.

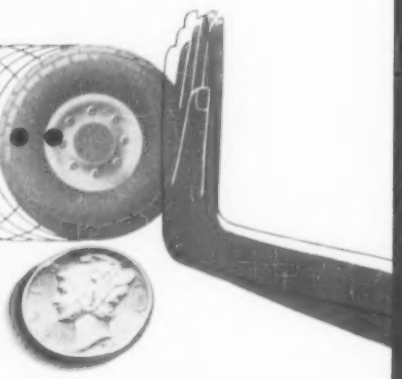
MINNEAPOLIS **Honeywell**

Aeronautical Controls

2600 Ridgway Rd., Minneapolis 13, Minn.

Every fighter, every bomber, every transport is Hydro-Aire equipped.

How to stop on a dime...



...and save a dollar!

The Hytrol Anti-Skid Braking System stops you on the money!

Safe, sure, *skidless* stops, even on icy runways, mean more completed scheduled flights. *That's money in the bank!* But for even greater financial advantages consider the Hytrol airline record of cash savings on tires and brake linings. Day after day Hytrol, by eliminating skidding, flat spots and blow-outs is making phenomenal savings on tire replacement and retreading. Tire changes due to flat spots have been eliminated completely. And because of the braking action, Hytrol is reducing brake lining costs by more than 36%.

Yes, Hytrol Anti-Skid Braking System, developed for greater safety and control in landing, has proved to have an important additional assist—a dollar and cents value that prominently reflects in operation economy.

SEND FOR THE COMPLETE **hytrol** STORY.

HYDRO-AIRE *Inc.*

BURBANK, CALIFORNIA

Subsidiary of Crane Co.

B.F.Goodrich

How B. F. Goodrich makes it hot for ice

SUPPLYING ice protection for any size or shape of airplane part is no longer a problem for B. F. Goodrich engineers. With flexible electric rubber, they can get a skin-tight fit over bulges, around tricky curves and corners.

A B. F. Goodrich development, electric rubber can be made only one-twentieth of an inch thick. Its core of electrical resistance wires supplies heat so intense that water droplets hitting will evaporate before they freeze. It is the most efficient method of supplying spot, anti-icing heat. It simplifies design, saves weight, can be cemented on. It requires little power to operate—two lead wires carry the electricity furnished by the plane's regular power supply.

Here are some applications—all of different shapes—where BFG electric rubber has given successful ice protection:

On prop shoes, it prevents ice from cutting down a plane's speed and maneuverability.

In a jet engine's intake, it stops ice from choking off engine air, vital for combustion.

In air scoops, it insures plentiful air supply for cabin heating systems and for cooling engine accessories.

On radio masts, it keeps ice from forming and causing them to snap off in the wind.

On elevator horns, it keeps them from freezing tight, insures easy control.

B. F. Goodrich electric rubber is also used on wings, hydraulic lines, water tanks, spinner domes, jet intake doors and many other airplane parts. It's a typical development of BFG's engineering and research for aviation. Other B. F. Goodrich aviation products include tires, wheels and brakes; De-Icers; Pressure Sealing Zippers; Avtrim; inflatable seals; Plastilock adhesives; fuel cells; Rivnuts; accessories. *The B. F. Goodrich Company, Aeronautical Division, Akron, Ohio.*

B.F.Goodrich

FIRST IN RUBBER

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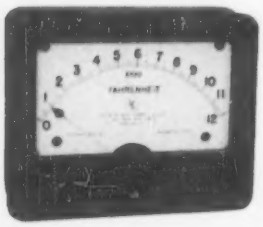
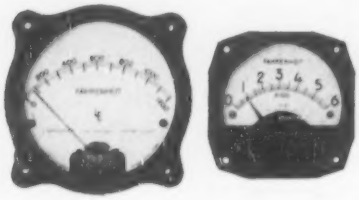
Indicating Pyrometers

for temperature testing in the laboratory or in the plane...

Constructed with the same care as our aircraft temperature indicators, these pyrometers bring "aircraft quality" to the test engineer.



MODEL 58PY, above, has been used extensively by leading motor car manufacturers for road testing on the "Proving Grounds" — where performance counts. Housed in rectangular bakelite case, has 6" hand drawn scale and is fully compensated for ambient temperature. Made in ranges listed below, with suitable thermocouple materials.



MODEL 23B, left above, has same type movement as our aircraft pyrometers. Housed in flanged, 4" round, bakelite case for panel mounting.

MODEL 20B, right above, has same 3" steel case and same movement as our aircraft panel indicators. Both are fully cold-end compensated and available in standard ranges listed, with suitable thermocouple materials.

STANDARD RANGES—All Models
FAHRENHEIT
Zero to 400, 600, 800, 1000, 1200, 1600, 1800, 2000 and 2500.
CENTIGRADE
Zero to 200, 300, 400, 500, 600, 800, 1000, 1100 and 1400.

Furnished with white scales, black markings and pointer or, with black scales white markings and pointer if specified. For best results use LEWIS Thermocouples, Leads and Selector Switches with these instruments.

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Manufacturers of Complete Temperature Measuring Systems for Aircraft
NAUGATUCK, CONNECTICUT

Aviation Week

Volume 58 June 29, 1953 Number 26

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Table of Contents on Page 8

47,192 copies of this issue printed

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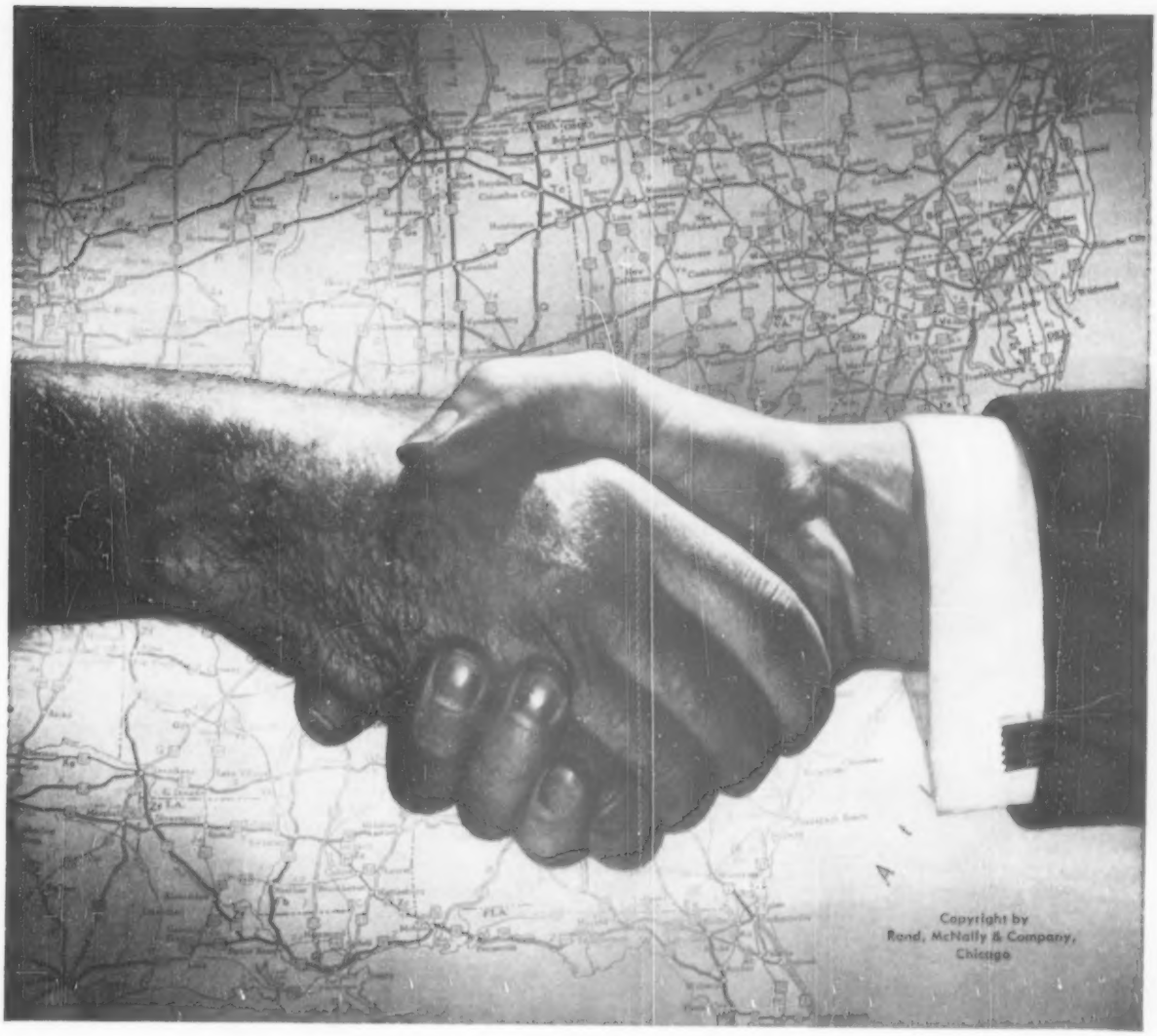

The thousand-mile handshake

When a company-owned Beechcraft Executive Transport is available for instant action, you and your key men find time to shake hands with field men, customers, new business prospects *regularly*. For example, you can leave at *your* convenience, cruise in relaxing comfort one thousand miles in less than five hours, tend to business, return that day. Home office work *can't* pile up.

Thousands of executives use this soundproofed Beech "Twin" in just such fashion daily. In *your* business, you could use more *time*. Investigate! Typical costs and operating data on request.

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Call your Beechcraft distributor or write Beech Aircraft Corporation, Wichita, Kansas, U.S.A.

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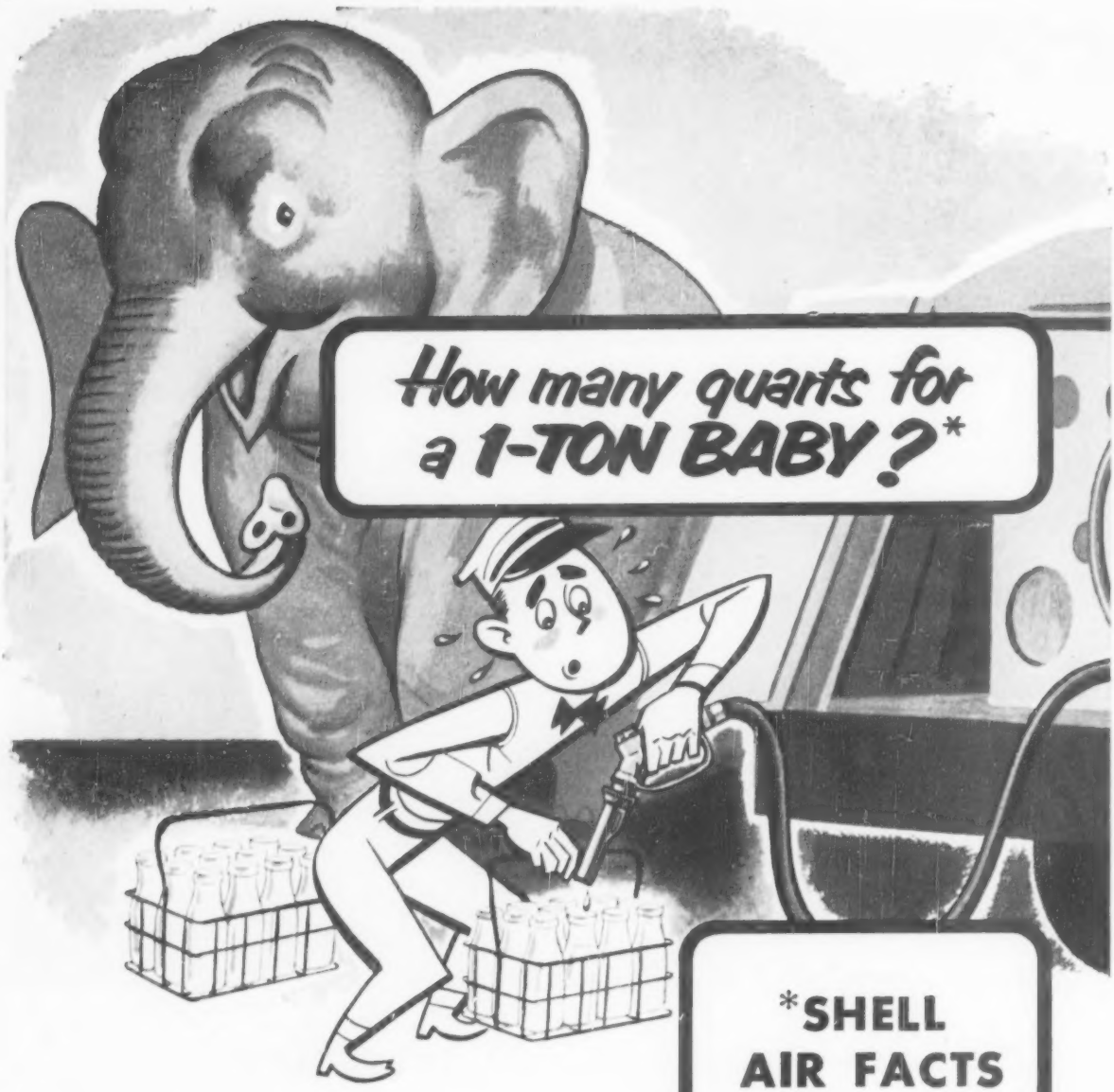

It's a fact, too—

Shell Aviation fuel carries the most freight... the most air mail ... the most passengers in the United States today.

*SHELL AIR FACTS

Air transportation is efficient:

A ton of freight—be it elephants or eggs—flies a distance of one mile on *less* than ⅔ of a quart of aviation fuel.

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SHELL

NEWS DIGEST

Domestic

Republic Aviation Corp. last week awarded Sncase (nationalized French aircraft manufacturer) a more-than-$30-million contract for spare parts for NATO's new F-84F jet fighters, scheduled to begin arriving in Europe next fall. Contract is the largest share of a $50-million order placed recently by USAF with the company's Swiss subsidiary, Republic Aviation (International), for Thunderstreak spares. The remaining funds are expected to be broken up into smaller contracts to European manufacturers that produce parts not made by Sncase.

Navy cancelation of orders for 30 Piasecki HUP helicopters will not result in layoff of production workers, company president Don Berlin said last week. The Morton, Pa., copter firm plans to increase production of some models, start new projects and build more parts now subcontracted to other companies.

Crash settlement totaling $100,000 has been paid by National Airlines to an Elizabeth, N. J., couple who suffered severe burns when an NAL DC-6 plunged into an apartment house Feb. 11, 1952, showering their third-floor dwelling with flaming gasoline. Meanwhile, Federal Judge A. E. Modarelli has ruled in favor of four other apartment dwellers seeking trial of injury claims stemming from the crash, clearing the way for hearings on 28 suits still pending.

Pratt & Whitney Aircraft announced last week it is beginning large-scale production of T34 turboprop engines and is offering a commercial version rated at 5,600 hp. to U. S. and foreign airlines.

Air Transport Assn. forecasts multi-engine helicopters capable of carrying 50 to 60 passengers will be ready for scheduled operation by 1959-60, suggests airline study of an ATA test program designed to compile data on effective copter competition with surface transports in the shorthaul intercity market.

Rear Adm. Apollo Soucek has been nominated chief of Navy's Bureau of Aeronautics for a four-year term to succeed Rear Adm. Thomas S. Combs, who has been recommended for promotion to vice admiral in command of an undesignated fleet.

New Fletcher Tested

Latest model of the Fletcher Defender single-seat tactical support plane, the FD-25-B, is seen taking off for the first time at Whiteman Air Park, San Fernando, Calif. Major change from previous FD-25 model is all-aluminum construction in place of magnesium makeup. The elevator also has been modified slightly, and lighter and more efficient radio gear is carried. First public showing of the new Fletcher FD-25-B will be at the National Air Show to be held at Dayton, Ohio, Sept. 5-7.

Full-scale replica of the Wright brothers plane that made the first powered flight 50 years ago has been completed by the Institute of the Aeronautical Sciences and 24 U. S. aircraft companies and will be displayed at the IAS annual summer meeting dinner July 15 at Los Angeles.

Old combat planes are sought by Wright-Patterson AFB, which wants to borrow these fighters and bombers for a parade of military aviation progress Sept. 5-7 at the National Aircraft Show, Dayton Municipal Airport: P-1, P-6, P-12, P-26, P-35, P-38, P-39, P-40, B-1, B-3, B-10, B-18, B-26, A-20 and B-24.

Braniff International Airways marked its 25th anniversary June 19.

Five aircraft companies exported 56 lightplanes valued at a total of $359,579 last month, upping 1953 foreign shipments to 188 units at $1,437,027, Aircraft Industries Assn. reports. Companies reporting May exports: Beech, Cessna, Piper and Taylorcraft.

Lockheed Aircraft Service completed conversion this month at LAS Burbank, Calif., of eight Trans World Airlines Constellations to 81-seat tourist configuration.

Aviation education workship will be launched July 23 for a five-week summer program at the University of Colorado, Boulder, under joint sponsorship of Civil Air Patrol and CU.

Pan American World Airways is furloughing approximately 80 co-pilots of PAA's total pilot roster of 1,340.

New $6-million terminal and other improvements at Miami International Airport are scheduled for start of construction this fall.

Financial

North American Aviation, Inc., Los Angeles, has declared a dividend of 75 cents per share, bringing total payments for the current fiscal year to $1.50 on 3,435,033 shares of stock outstanding.

Northwest Orient Airline has declared a regular quarterly dividend of 28¾ cents per share of 4.6% cumulative preference stock.

International

Panair do Brasil Constellation crashed and burned June 17 during a landing approach to Sao Paulo, Brazil, Airport, killing 10 passengers and seven crewmen.

Thirty-three persons were killed in the crash of an Air Laos Co. DC-3 June 17 in the jungle near Pakse, Indochina.

Air Vice Marshal Thomas G. Pike, former deputy chief of staff at Headquarters, Allied Air Forces Central Europe, has been named assistant chief of the air staff of the Royal Air Force.

Airline traffic transactions put through the International Air Transport Assn. clearing house in London totaled $17,934,000 last April, an increase of $625,000 over turnover registered during the same month of 1952, IATA reports.

AIRBORNE

is proud that these Companies are among its many customers

RAYTHEON | GOODYEAR AIRCRAFT

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Production quantities of our actuators have been delivered to these well-known companies during the past year. To such leaders we owe our continued growth.

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The Aviation Week

June 29, 1953

Headline News

1st U. S. Jet Liner to Be Fastest..... 12
AF to Clarify Heavy Press Cuts..... 14
Wilson Hits AF 'Over-Financing'..... 15
AF Axes Kaiser Aircraft Role..... 16
House Vetoes Wilson A-Fund Cut..... 17
RAF Picks Swift Over Hunter..... 18

Aviation Safety

AF Research Cuts Crash Rate..... 21

Production

Forum Studies Big Presses..... 28
Boeing Triples Windtunnel Power..... 36
Magnetic Blocks Aid Computer Design 39
Now Showing on TV: Jet Tests..... 43

Avionics

Hughes Aircraft Accents the New..... 44

Equipment

Runway Light Nears CAA Ideal..... 58

Air Transport

CAB Starts Subsidy Cuts..... 63
NWA Re-organizes Management..... 63
Loftleidir Cuts Fares, Wins Loads..... 64
Brazil Airline Wins U.S. Route Rights 64
Rail Losses Spur P. O.'s Airmail Drive.. 64
Braniff Ties Route Award to Subsidy... 65
CAB Names Griffith Enforcement Chief 65
N. Y.-Balboa Case Due for Rehearing. 65
Douglas DC-6C..... 66
CAA Cool to ATA Reorganization Plan 68

Editorial

TWA's Revitalized Management..... 78

Departments

News Digest..... 7
Picture Page..... 9
Who's Where..... 11
Industry Observer..... 11
Navy Contracts..... 36
Fast Writeoffs..... 42
Production Briefing..... 43
Filter Center..... 56
New Aviation Products..... 59
Also on the Market..... 60
CAB Orders..... 68
Shortlines..... 76
Aviation Calendar..... 76

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WESTERN AIR LINES uses

PASTUSHIN FLUID-TIGHT Rivets

"Maintenance of integral fuel tanks in Western's new fleet of Douglas DC-6B Airliners is made easier with Pastushin FLUID-TIGHT rivets," says Tony Favero, Western Air Lines Superintendent of Maintenance.

Western, like many other airlines and aircraft manufacturers has discovered this fact: Pastushin FLUID-TIGHT rivets save maintenance man-hours, and do a better job wherever full-strength, permanent leak-proof joints are required.

Pastushin FLUID-TIGHT rivets are fully approved by Air Force, Navy and C.A.A.

ADVANTAGES

- Completely leak-proof
- Easy to install
- Full rivet strength values
- Replaces standard AD rivets without loss of joint efficiency
- Uses conventional riveting tools and methods
- All sizes and shapes available

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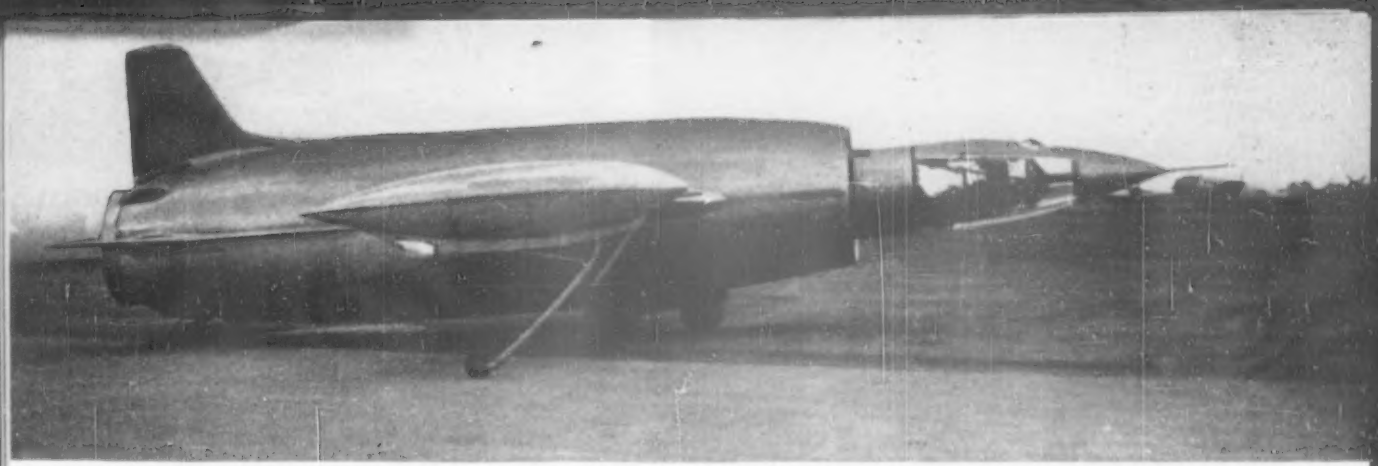
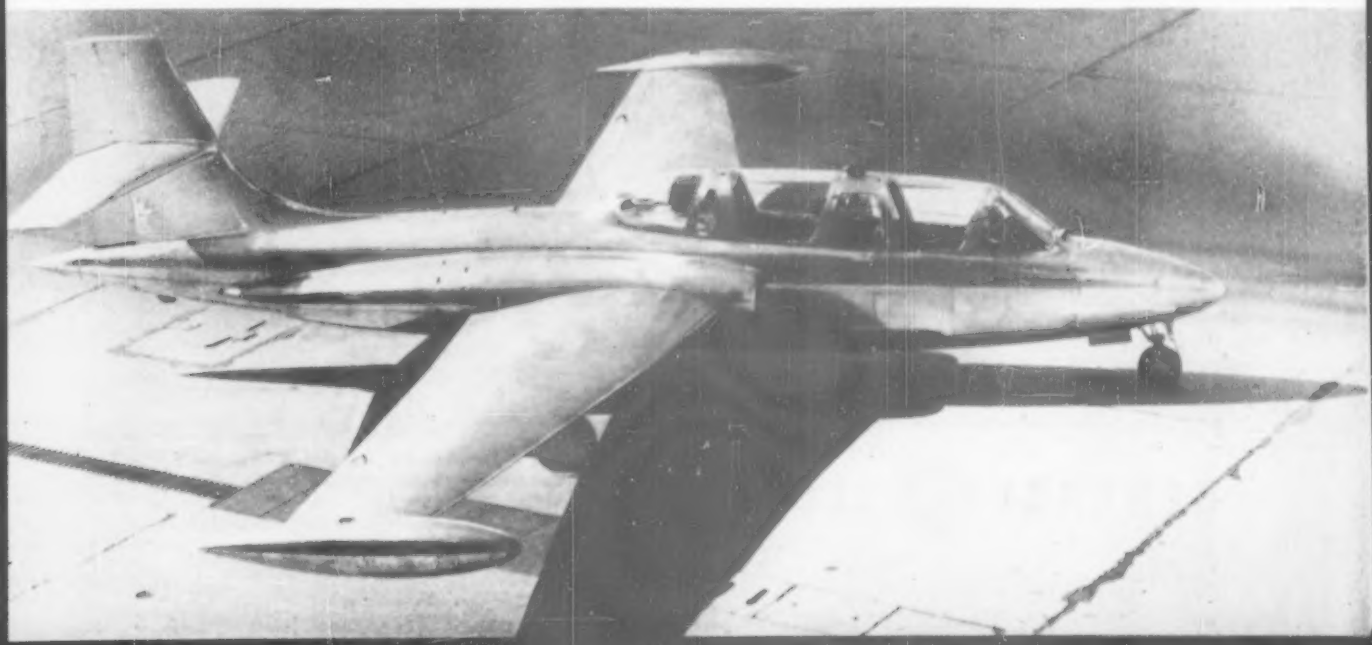


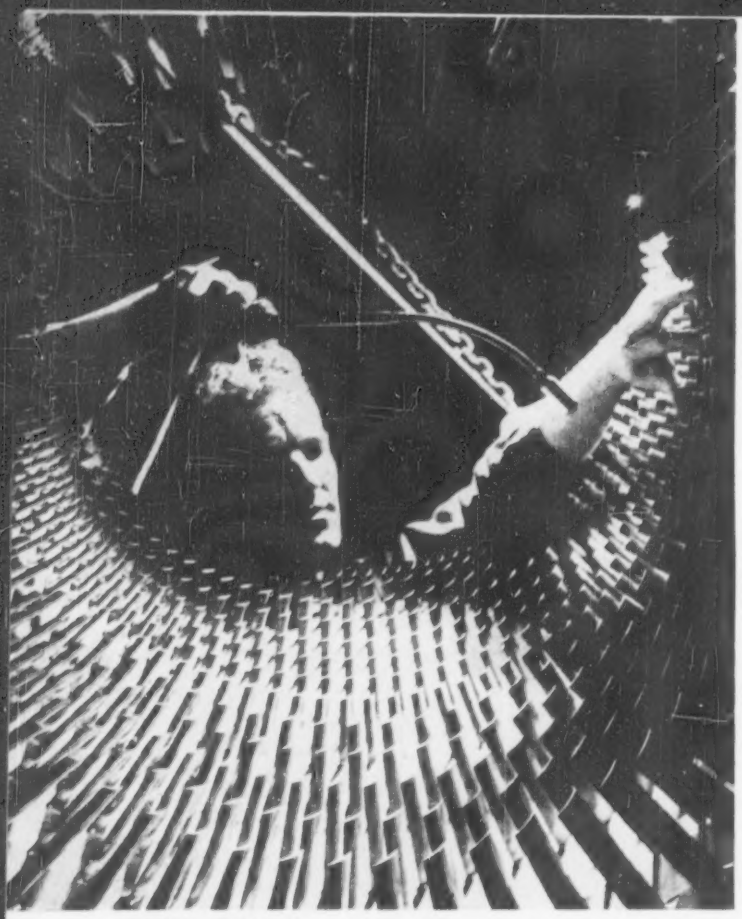
NEW LEDUC RAMJET—Most data is secret on the Leduc 021, third of a series of prototypes sponsored by the French Air Ministry, but the straight-wing craft reportedly weighs some 11,000 lb. and is designed to attain Mach .95 in level flight. Apparent differences from earlier models include jettisonable cockpit placed ahead of inlet, tandem main wheels and tiptanks. Note retractable outrigger wheels. Flight tests are underway.

Latest Styles in French Aircraft

FLYING ANTI-TANK WEAPON—Lightweight Potez 75 is designed as a low-cost, easy-to-produce tank-killer, using rockets or air-to-ground guided missiles. To provide optimum visibility, a twin-boom layout is used. Plane is powered by a 450-hp. Potez 8D32 piston engine. It spans 43 ft. and has a 30-ft. length. Gross weight is 5,280 lb. and empty weight 3,685 lb. Cruising speed is given as 147 mph. and range as 270 mi.

NEW MAGISTER JET TRAINER—Latest two-place Fouga Magister (below) features a conventional tail in place of V-configuration on the earlier model. Plane shown is designated CM. 170R-02. Two 800-lb.-plus-thrust Turbomeca Marbores are used, one on each side of the fuselage.





CAREFUL INSPECTION of all jet engine parts is an important phase of the work done at General Electric's Los Angeles modification shop.

WEST COAST DEFENSE is fortified by North American F-86D. L.A. shop assures plane's G-E powerplant peak performance.

INSTALLATION OF AFTERBURNERS is typical L.A. shop job. Facility can be quickly adapted to other engine projects.

West Coast Link of G-E World-wide Service Chain Assures Peak Turbojet Performance

LOS ANGELES SHOP HAS MODERNIZED OVER 1000 G-E JET ENGINES

OPTIMUM ENGINE PERFORMANCE is assured users of G-E turbojets by G.E.'s world-wide jet service engineering organization. For example: The Los Angeles modification shop—West Coast link of this world-wide chain—has modernized more than 1000 G-E jet engines.

AS ENGINE IMPROVEMENTS are developed by G-E engineers, they are incorporated by the modification shop. This assures users of G-E engines in service of the latest advances even before these improvements can be tooled into the mass production lines.

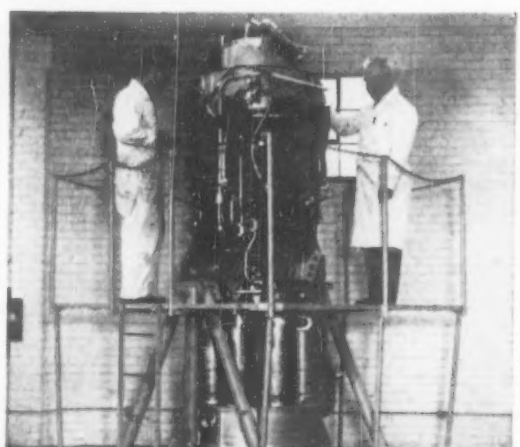
WEST COAST AIRFRAME MANUFACTURERS, and USAF depots and bases using G-E jet engines, are served by the centrally-located L.A. shop. Additionally, trained shop representatives are sent into the field to assist and teach operating personnel new techniques and the use of new tools. Training programs are also conducted by the shop for G-E jet engine users as well as G-E personnel.

MEETING THIS IMPORTANT STEP in the manufacturer-to-operator process, the L.A. modification shop is another of the many services offered G-E jet engine users. *General Electric Co., Schenectady, N. Y.*

230-16

You can put your confidence in—

GENERAL ELECTRIC



SPECIAL STAND (above) and other Company-developed tools and jigs save time and cost of rebuilding engines.

WHO'S WHERE

In the Front Office

Robert A. Lovett, former Secretary of Defense, has been elected a director of North American Aviation, Inc., Los Angeles, Calif.

Frank Pace, Jr., former Secretary of the Army and now executive vice president of General Dynamics Corp., and **Lawrence B. Richardson,** General Dynamics senior vice president, are new vice chairmen of the board, Consolidated Vultee Corp. **August C. Esenwein,** manager of Convair's Ft. Worth Div., has been elected a vice president. Changes at the San Diego Div.: **P. M. Prophett,** manager of F-102 flight test operations, and **W. B. Harwell,** manager of flight production.

E. A. Bellande, vice president and manager of AiResearch Aviation Service Co., has been appointed vice president and assistant to the president of the parent organization, Garrett Corp., Los Angeles. **J. J. O'Brien** is new manager of AiResearch Aviation Service.

T. A. Weiss, Jr., and **B. C. Reciputi** have formed an aviation consultant corporation known as Reciputi & Weiss, Inc., serving as president and vice president respectively.

Changes

Lee A. Telesco has been named executive assistant to the vice president of Philippine Air Lines.

Paul F. Kriethe has been appointed administrative assistant to the senior vice president of Continental Air Lines.

Ray D. Gaynor has been promoted to chief project engineer for Northrop Aircraft, Inc., Hawthorne, Calif. **Sherman Pruitt, Jr.,** is new production test pilot.

Warren E. Alberts has been named director of industrial engineering for United Air Lines.

Stewart Faulkner has resigned as director of publicity for Continental Air Lines and joined Trans World Airlines as public relations manager in Los Angeles, succeeding **Emmet Riordan,** now Middle and Far East manager of public relations, Cairo.

Edward H. Gunton has been named assistant manager in charge of operations at Solar Aircraft Co.'s Des Moines plants. Other changes: **William Dixon,** Production Engineering Div. manager, and **Marvin L. Nelson,** manager of the Quality Control Division.

Honors & Elections

Brig. Gen. Samuel R. Harris, Jr., commanding general of Arnold Engineering Development Center, Tullhoma, Tenn., has been awarded the Air Force's Legion of Merit for "outstanding service during the organizing of the Air Research and Development Command."

Maj. Lester D. Gardner has been presented the American Legion's Medal of Merit for "actively aiding in the development of aviation, especially his founding of the Institute of the Aeronautical Sciences."

INDUSTRY OBSERVER

► Pentagon sources say there was another exception to Defense Secretary Wilson's report that combat strength has not been cut in the defense cutbacks. This little-known victim of the economy ax was the short-range air-to-air missile Meteor, a Navy Bureau of Ordnance project. Three contractors shared the cutback: Bell Aircraft, Massachusetts Institute of Technology, and Federal Telecommunications Laboratories at Nutley, N. J.

► Convair-Ft. Worth's new cyclic maintenance and modernization program—which just started with the YB-36, second of the aircraft to be built, and ultimately will encompass all B-36s in service—is designed to get a standard configuration for all the big bombers. It will mean greater interchangeability of parts and major components between the different B-36 models. Nearly 6,000 persons will be employed in the program at its peak.

► Air Force has disclosed a $644,000 project for modification of six Martin B-61 Matador pilotless bombers to incorporate test equipment which later will be used in test and training programs on the Hughes Falcon, anti-aircraft weapons, other types of pilotless aircraft, and rockets.

► Boeing-Seattle's new hangar will have the largest unobstructed doorway in the country, 785 ft. long, 65 ft. high, and is designed to house four B-52 Stratoforts at once. This is another indication that the prospects for quantity production of the big eight-jet bomber are brighter than some people say.

► Mooney Aircraft, Kerrville, Tex., has two adaptations of its Model 18 one-placer in development contracts for military applications. Mooney expects to get production rate of the Model 18 up to one a working day by August, while grooming the four-place Model 20 Scotsman prototype—due to fly any day now—for quantity production.

► A new device which flashes a light or rings a buzzer in the cockpit of an airplane in flight when a ground station wants to talk to that specific flight crew has been developed by Pan American World Airways Pacific-Alaska Division and is currently undergoing tests. The system, called Selective Signalling (Selsig) by PAA, frees the flight crew from continuously monitoring its receiver over long flights, particularly during static conditions. Several domestic airlines also are interested in Selsig, which requires only the addition of a small amplifier in the airplane.

► One American Airlines flight crew will be able to fly the U. S. continent without relief crew for the first time this fall when American Airlines gets its first Douglas DC-7s for nonstop transcontinental service.

► New de Havilland Gyron jet engine is described as Britain's first in the 15,000-lb.-thrust class, but is now running at considerably below that rating. Gyron is a simple, lightweight jet with a very high efficiency compressor. Contrary to some reports it is not using titanium; nor is its development to 20,000 lb. likely in less than five years. De Havilland and General Electric engineers worked closely on the engine's development under terms of the de Havilland-GE technical assistance agreement. Development costs of around $2.5 million, all private venture capital, are in this engine. Prospects are it will be the powerplant for several of the next generation of British jet fighters still on the secret list.

► Rolls-Royce may get off-shore purchase contract to supply Avon R. A. 7 jet engines for the F-86Ds which Fiat will build in Italy. However, the first 50 airplanes or so will still have GE J47 powerplants. First Australian-built Avon-powered Sabre is due to fly in about a month. British say that on paper Avon-Sabre performance curves show up better than current Sabres, MiG-15s, Hunters and Swifts. Ironically, two years ago Rolls turned down a proposal to supply Avons for Canadian-built Sabres given RAF under arms aid. Instead, USAF supplied GE engines. Now Rolls has Avons to spare.

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Boeing Project X Details

First U.S. Jet Liner to Be World's Fastest

- **Prototype is scheduled for first flight in 1954.**
- **UAL and AA appraise transport next month.**

Boeing Airplane Co.'s new swept-wing, four-engine Model 707 jet transport is expected to hold a considerable edge in speed and power over de Havilland Comets, first details of the prototype revealed last week.

Specifications for the new jet liner now are in the hands of potential airline customers.

Data available indicates the 707 will cruise in the near-600-mph. class, presumably around 580 mph. But the airliner may achieve block-to-block speeds in normal transport operations as high as 550 mph. for some distances.

This would give Boeing an appreciable advantage over de Havilland, now quoting 470 mph. speed for the Comet 1, 500 mph. for the Comet 2 and slightly more than 500 mph. for the Comet 3.

Details of the 707 were not authorized for release by Boeing but AVIATION WEEK was assured of their accuracy by reliable sources.

With the big airplane already under construction at Boeing's Seattle plant and due for first flight in the summer of 1954, it is assumed the quoted specifications are fairly well crystallized. Except for minor changes made as the prototype progresses, the 707 is expected to roll out of the hangar next June essentially as it is described.

▶ **Open Choice**—There is a possibility of more serious alterations, however, after a West Coast conference next month with American and United Air Lines—two of the biggest potential customers for the 707 airplane. The airlines are expected to confer with the four big West Coast transport makers—Boeing, Douglas, Lockheed and Convair—on what jet liner equipment the air carriers will buy. Any changes the airlines ask within reason probably will be made, if alterations mean a sale.

Cost of the jet transport has been estimated at $4 million (AVIATION WEEK May 4, p. 14).

Contrary to recent reports, there still is an open choice between the turbojet and turboprop types of transport. Jets hold the advantages of earlier delivery and more proven powerplants over unavailability and scanty service record of large U.S. turboprops.

Designed for nonstop transcontinental and for trans-Atlantic service, the new 707 is larger and heavier and carries more payload than the earlier Boeing Model 473 jet transport design or current piston engine Stratocruiser.

▶ **25,000-Lb. Payload**—A gross weight figure of 190,000 lb., including 25,000 lb. payload, is quoted for the 707, compared to 145,800 and 18,750 lb. for the Stratocruiser and 135,000 and 16,000 lb. for the never-to-be-built paper Model 473.

A domestic version passenger arrangement for the 707, described in data submitted to airlines, calls for five-abreast seating, with a total capacity of 100 passengers.

▶ **Edge Over Comet**—Boeing has announced that Project X, first designation for the 707, will be powered by four P&WA J57s.

The new airline data discloses that the engines selected will be a commercial version of this powerplant, designated as JT3L. It is rated at 11,000 lb. thrust, with water injection. The JT3Ls will make Boeing's jet prototype the most powerful transport flying next summer, holding a considerable edge over the de Havilland Comet 2 with its Rolls-Royce Avon 3 jets, rated at 6,500 lb., and the succeeding Comet 3 with Avon 16s, rated at 9,000 lb.

▶ **Stretched-Out Stratocruiser**—The 707 is comparable to a stretched-out Boeing Stratocruiser in dimensions and general layout of the fuselage. Fuselage length is 127 ft. 10 in. overall. But this includes sweepback of the horizontal stabilizer and elevator, so actual fuselage length is 122 ft. 2 in. Passenger cabin is 89 ft. 7 in. long. Fuselage diameter is 132 in.

Stabilizer span is 39 ft. 8 in., total height of airplane is 38 ft. 3 in. to top of fin. Maximum height with fin/rudder folded: 22 ft. 6 in. Clearance inboard pods from ground is 37 in.

This compares with 110-ft. 4-in. overall length of the Stratocruiser. However, only the upper deck of the 707

Weight Statement for 707

Boeing quotes the following weights for a five-abreast standard domestic passenger version of its new 707 jet transport in a statement to potential airline customers:

Weight empty	**88,890 lb.**
Service and buffet equipment for passengers and crew	520 lb.
Water and food for passengers and crew	670 lb.
Crew & baggage (three in cockpit, three in cabin)	1,080 lb.
System fuel and oil	920 lb.
Pyrotechnics	40 lb.
Operating weight empty	**92,120 lb.**
100 passengers	16,000 lb.
Passenger baggage	4,000 lb.
Cargo	5,000 lb.
Total payload	**25,000 lb.**
Fuel (11,212 gal. at 6.5 lb./gal.)	**72,880 lb.***
Gross weight	**190,000 lb.***

* *Apparently Boeing was allowing some 12,000 lb. leeway in its calculations.*

707 Takeoffs, Landings

Following are Civil Air Regulation field length requirements for takeoffs and landings of the new Boeing 707 jet transport design, as reported by Boeing to potential airline customers:

	Takeoffs
At 120,000 lb.	4,600 ft.
At 160,000 lb.	5,100 ft.
At 180,000 lb.	6,700 ft.
At 190,000 lb.	7,700 ft.
	Landings
At 90,000 lb.	4,400 ft.
At 120,000 lb.	5,700 ft.
At 140,000 lb.	6,600 ft.

prototype carries passengers; lower deck is designed for baggage and cargo. The 707 fuselage appears oval from the front with sides of the Stratocruiser's "figure 8" filled in.

▶**External Configuration**—The 130-ft.-span wing of the 707 is swept at the same 35-deg. angle used by Boeing for the B-47 and the B-52 bombers and is set slightly forward of the fuselage midpoint. It is set lower than a normal mid-wing position.

Four jets are slung under the wing in single pods, spaced out as follows: from centerline of fuselage to centerline of inboard pods, 26 ft. 7 in.; from centerline of fuselage to centerline of outboard pods, 45 ft. 7 in.

Pods are interchangeable, permitting 30-min. engine change time. Single-piece removable nose cowls are provided; side cowling hinges at the top and folds outward. Fireproof lines and fittings are specified throughout the nacelle area, and a fire seal separates the compressor section from the burner and turbine section at rear.

▶**Fuel Arrangement**—This is how fuel tanks are installed: outboard of the outboard pods, one 470-gal. tank in each wing; between pods in each wing, one 2,170-gal. tank; between inboard nacelles and fuselage, two tanks in each wing, with 2,350-gal. tanks next to pods and 1,850-gal. tanks next to fuselage. This adds up to 13,680 gal. Additional 4,200-gal. capacity is in the wing center section.

Single-point, under-wing refueling is provided, with one location under each wing. Fuel system is suitable for use with fuels containing up to 30% aromatics, including JP-1 and JP-4.

▶**Control Surfaces**—Ailerons have inboard and outboard sections, the former used at all speeds. But outboard ailerons are locked when flaps are retracted, used only at low speeds.

Spoilers, similar to those used on the B-52, are located on the upper surface of the 707 wing just forward of the flaps. There is a set of two spoilers for each flap section to augment lateral control and increase drag. Flap deflection is 20 to 30 deg. for takeoff, 50 deg. for landing.

▶**Wing Loading**—Wing area of the 707 adds up to 2,400 sq. ft., compared with 1,769 sq ft. for the Stratocruiser. This figures out to a 79.16 lb./sq. ft wing loading for the 707 at 190,000 lb gross weight, compared with 80.5 lb./sq. ft. for the Stratocruiser at 145,800 lb.

The 707 wing appears relatively thick at the root. Its aspect ratio is 7.0, has a .34 taper and a 7-deg. dihedral.

▶**Landing Gear**—Main landing gear is a four-wheel bogie arrangement similar to the B-47 gear, retracting inboard into the belly.

Nose gear with dual wheels retracts forward, has a maximum turning angle of 55 deg. tread of the main gear is 21 ft.

▶**B-47 Profile**—Cockpit is not faired into the nose fuselage contour but protrudes with obvious design attention to better visibility for pilots.

Side view of the airplane is reminiscent of the B-47: fuselage appears to have a constant diameter from the cockpit to well aft of the trailing edge, where the top line continues straight back to the tail; bottom slopes up in a straight line to come to a near point at the tail.

▶**Pneumatic Starters**—Engine starters are pneumatic, and other auxiliary power with the aircraft has not been finally selected. However, increasing use of pneumatics in large military aircraft because of the weight saving of air compared with oil, as an actuating fluid, may be reflected in this commercial design.

Boeing's earlier transports—307 Stratoliner and 377 Stratocruiser—were almost entirely electric auxiliary power.

Grumman in AIA

Grumman Aircraft Engineering Corp., Bethpage, N. Y., after going it alone 11 years, has affiliated with Aircraft Industries Assn., the last major aircraft manufacturer to join.

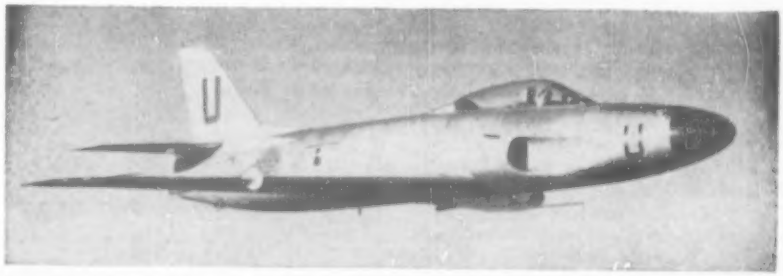
Grumman withdrew from the old Aeronautical Chamber of Commerce, AIA's predecessor, in 1942 and had not been affiliated with an industry association since. AIA now has 120 corporate members, including virtually every major airframe and powerplant manufacturer and most of the big component makers.

AA Predicts Summer Air Traffic Record

American Airlines predicts an all-time boom for air transport business this summer. Sales vice president R. E. S. Deichler says the summer rush started earlier than usual this year.

He reports American's passenger volume gained 20% last May, compared with a year ago. Load factor dropped four points because capacity gained 25% with addition of eight new 54-passenger Douglas DC-6Bs in the past 12 months.

American's aircoach capacity next month will be nearly double last July.



NEW LOOK AT SWEDISH ATTACK JET

Latest views of the new two-place all-weather Saab-32 (A-32) Lansen attack plane recently ordered into production by the Royal Swedish Air Force. These pictures show the first prototype, powered by a Rolls-Royce Avon axial-flow turbojet. Production Lansens will have a later model of the Avon, built in Sweden and equipped with an afterburner. Note side-opening cockpit canopy and short leading edge wing fences.

Press Slashes Heavier Than Expected

Cutback in the heavy press program comes as no surprise to many segments of the aircraft industry and its related activities, although extent of the slice was more than expected.

From the start of the program, AVIATION WEEK has learned, many in the industry felt the heavy press plan was too ambitious, that its initiation should have been contemplated on a more modest scale, with progressive expansion as conditions and experience warranted.

▶ **Program Paradox**—It has been the belief of some sources close to the operation that the foreseeable need for forging and extruding machines did not justify so large a program.

One seemingly paradoxical development in the program revision is the elimination of the two largest extrusion presses—20,000-ton units—while the heaviest tonnages in the forging machines have been retained. While Air Force Secretary Talbott stressed that technical and development problems involved with the heavy presses would take time to work out, many in the industry feel there is greater familiarity with the extrusion art than with forging work. Also, extrusions have been used to a greater extent in aircraft designs.

▶ **Demand Slow**—Despite the drastic slice, there is industry opinion that designs in existence for modern aircraft and those being projected will not suffer. The belief is that adequate duplication of heavy presses still will be available to accommodate the design load. Surveys are said to have indicated that demand for big plane parts from the new presses will be relatively slow in coming, because requirements do not develop overnight.

A lot has been learned about heavy forging since the program was initiated, and multiple installations in a single plant should increase production efficiency. A new factor now is that fewer aircraft are in the picture.

AF to Clarify Heavy Press Cuts

Aircraft industry leaders looked to a Wright Field conference last week for clarification of the apparently confused Air Force heavy press program now substantially curtailed.

After slicing the program from 17 presses to 10, Assistant Secretary for Air Roger Lewis called the industry conference in Dayton, presumably to announce exactly what was in store for the firms involved.

Pentagon and AMC officials who have been responsible for the program since its inception in 1951 were ordered to keep mum on the cutback pending the Lewis conference.

▶ **More Cuts?**—Industry spokesmen still apparently are in the dark as to how the slicing was done. There was a hint there might be additional cuts, although it is known that Defense Secretary Charles E. Wilson has approved the program as it now stands in establishing his present defense plan.

In unwrapping the revised heavy press schedule, Air Force Secretary Talbott stated the move resulted from:

- "A belief that the number of presses is in excess of requirement.
- "Use of heavy presses in the aircraft industry involves some technical and developmental problems which will take time to work out."

"It is considered prudent," said Talbott, "to erect a limited number of presses, learn to use them, and place them in operation before erecting others. We have had no experience with very big presses and it is possible that as we begin to use them we may want to do things differently than we now think."

▶ **The Cancelations**—How much the present cutback will save the Air Force eventually is not yet disclosed. But value of the program before revision was around $389 million minimum.

Here are the seven presses canceled:

- **35,000-ton** forge by E. W. Bliss Co. for Kaiser Aluminum & Chemical Div., Newark, O.
- **25,000-ton** forge by E. W. Bliss Co. for Kaiser Aluminum & Chemical Div., Newark, O.
- **35,000-ton** forge by United Engineering & Foundry for Harvey Machine Co., Torrance, Calif.
- **25,000-ton** forge by Baldwin-Lima-Hamilton for Harvey Machine Co., Torrance, Calif.
- **20,000-ton** extrusion by Loewy Construction Co. for Alcoa, Lafayette, Ind.
- **20,000-ton** extrusion by United Engineering & Foundry for Harvey Machine Co., Torrance, Calif.
- **8,000-ton** extrusion by Loewy Construction Co. for Kaiser Aluminum & Chemical Div., Halethorpe, Md.

All forging and extrusion presses canceled were due for delivery during 1954. Kaiser and Harvey were hardest hit by the slash. Kaiser's two forging presses for Newark, Ohio, were 75% completed when Air Force dropped the knife. Taking Harvey Machine out of the picture means no heavy presses will be in operation on the West Coast.

Of two forging and two extrusion presses slated for Alcoa only an extrusion press for Lafayette, Ind., was hit. AVIATION WEEK reported Mar. 2 that "Alcoa at Lafayette is said to be up to the hilt in work on its extruder." Alcoa's two forging presses slated for Cleveland are underway.

▶ **What's Left**—With the Air Force revision, here is the way the heavy press program now stands:

- **50,000-ton** forge by Loewy Construction Co. for Wyman-Gordon Co., No. Grafton, Mass.
- **35,000-ton** forge by Loewy Construction Co. for Wyman-Gordon Co., No. Grafton, Mass.
- **50,000-ton** forge by Mesta Construction Co. for Alcoa, Cleveland, O.
- **35,000-ton** forge by United Engineering & Foundry for Alcoa, Cleveland, O.
- **8,000-ton** extrusion by Loewy Construction Co. for Harvey Machine Co., Torrance, Calif.
- **8,000-ton** extrusion by Loewy Construction Co. for Reynolds Metals Co., Phoenix, Ariz.
- **8,000-ton** extrusion by Loewy Construction Co. for Kaiser Aluminum & Chemical Div., Halethrope, Md.
- **12,000-ton** extrusion by Loewy Construction Co. for Curtiss-Wright Corp., Buffalo, N. Y.
- **12,000-ton** extrusion by Lombard Corp. for Reynolds Metals Co., Phoenix, Ariz.
- **13,200-ton** extrusion by Schloemann Eng. Co. for Alcoa, Lafayette, Ind.

C-124 Crash

A team of Air Force flight safety investigators, headed by Maj. Gen. Victor E. Bertrandias, Air Force deputy inspector general, last week was examining the wreckage of the Douglas C-124 Globemaster which crashed and burned after takeoff from Tachikawa Air Base, near Tokyo, Japan, June 18.

The plane carried 129 U. S. service men, all of whom were killed. It was the biggest airplane death toll in aviation history.

One Japanese witness reported two of the plane's four Pratt & Whitney R4360 Wasp Major engines appeared not to be operating when the plane turned back in an attempt to make a GCA landing.

Pilot reported one engine out, that he was returning to the base. But the plane, with full fuel load, went into a flat spin and crashed in a muddy rice paddy, not far from the airfield.

Wilson Hits AF 'Over-Financing'

But Vandenberg charges that budget cuts will result in "increasing over-balance" of combat aircraft.

Gen. Hoyt Vandenberg's recommendation for a $1.4-billion increase in Air Force's fiscal 1954 budget is described by Defense Secretary Charles E. Wilson as "over-financing" of an already "over-financed" USAF.

In a point-by-point rebuttal of the outgoing USAF Chief of Staff's proposal, Wilson advised the Senate Military Appropriations Subcommittee that projects covered by the $1.4 billion could be provided for by re-allocating defense funds.

He asserted: "In essence the Vandenberg proposal is simply a request for more money and is not substantiated by supporting information or a showing as to the utilization of funds otherwise available."

► **Voluntary Trimming**—The Wilson regime cut USAF's budget from the $16.7 billion recommended in January by the Truman Administration to $11.7 billion.

Vandenberg denounced the $5-billion Air Force cut before a congressional hearing but later asked for restoration of only $1.4 billion. Delays caused by the Wilson cutbacks already had interfered to make some expenditures unwise, he said, and the Air Force voluntarily had trimmed some more. This was the minimum to put the 143-wing program back on the track.

► **Increasing Over-Balance**—Last week, General Vandenberg continued his campaign at an Aero Club of Washington farewell luncheon in the presence of his successor as USAF Chief, Gen. Nathan F. Twining.

Vandenberg said: "If it had been the deliberate intention of members of the Office of Secretary of Defense to hamper and delay the Air Force program, they could scarcely have taken actions which would better have served such a purpose. Just when personnel shortages and base deficiencies became more critical than ever before in our history, these elements of the Air Force were selected by the Office of Defense Secretary to absorb minor but significant reductions which cannot be borne.

"Just when production has begun to roll and is no longer a serious problem, the Office of the Defense Secretary announces accelerations and retards the other elements of the force. The result will be an increasing over-balance in the direction of combat planes."

► **Manpower Restrictions**—General Vandenberg charged that, as a result of the Wilson cuts, the recruiting induction and training systems of the Air Force were "thrown out of gear at a time when they should be operating at maximum effectiveness.

"In May and June," he said, "the Air Force had to turn away 23,000 volunteers, with a total shortage of military and civilian personnel for the 143-wing program exceeding 100,000."

The new stretchout is due not to production slippages, he said, but to current restrictions on manpower and base construction activities that are delaying the 143-wing program.

Vandenberg indicated he accepted, with misgivings, the $500-million cut of 145 B-47 bombers for training units and the $250-million slash eliminating the beginning of a combat aircraft reserve.

"B-47 bombers and crews will have to be diverted from combat units to complete the training of B-47 pilots," he said. "These planes, their crews and support and the small war reserve will be missed. But since more and more people seem now to be willing to take the gamble that new weapons will enable the Air Force to win a war quickly, it may be that we will have to give up entirely the hope of a ready combat reserve."

► **Luxurious Substitute**—He urged reinstatement of funds for approximately 450 airlift and support aircraft, saying they are necessary for Army air mobility.

"I am disturbed by the fact that the first steps taken toward cutting back the strength of the Air Force were taken at the expense of airlift for all the armed forces," the AF Chief of Staff said. "This resulted apparently from a tendency to regard airlift as a kind of luxurious substitute for surface transportation.

"We have learned that many movements of supplies and particularly of personnel can be accomplished more cheaply by aircraft than by other means. Airlift is a life-and-death necessity for any kind of force other than massive and overwhelming ground forces, which we do not possess and will never possess.

"The more sudden the war and the greater violence resulting from new weapons, the greater will be the necessity for fast movement."

Here are Vandenberg's requests for $1.4 billion in additional funds, with the answers Wilson made:

$353 million for procurement of 447 airlift and support aircraft.

"If these planes are found necessary, they can be financed without additional money," Wilson said. With the $3.5 billion requested for fiscal 1954, USAF will have $23.1 billion for financing procurement of aircraft and related materiels as of July 1. At a spending rate of $550 million a month, this would finance the program for 42 months, or three and a half years. If $353 million is added, he contended, it would do no more than add 20 days—less than a month—to the advance period for which funds are available, boosting it to 42 months and 20 days.

The Defense Secretary: "The additional 447 airlift and support aircraft stated as required, if found to be necessary in the financing period, can be financed by reducing over-financed lead time in the present funding program."

As of July 1, 1954, Wilson said, Air Force will have money to finance the procurement program at a $550-million-a-month rate for 30 months or two and a half years—without any new fiscal 1955 money.

"The real question," he suggested, "is whether further reductions in new money for '54 fiscal year should not be made to reduce to a reasonable basis the two and a half years of financed lead time which will be carried into '55 fiscal year."

Wilson said that in chopping USAF's budget for aircraft and related procurement from $6.6 billion to $3.5 billion, he made reductions of $4 billion and additions of $1 billion, making a net reduction of $3.1 billion in the Truman budget's estimate. The reductions were:

- **Elimination of funds** for aircraft not ready for production in the period to be covered with 1954 financing: $1 billion.
- **Reductions in numbers** of support-type aircraft, such as transports, trainers and helicopters: $476 million.
- **Elimination of a trainer (T-36)**, which he said was marginal to Air Force requirements and was in any case being eliminated by AF: $250 million.
- **Reduction in B-47** for training units: $372 million.

CPA Comet Service

More than three months after the crash of its first Comet 1A Mar. 3 at Karachi, India, on its delivery flight, Canadian Pacific Airlines announces this decision on projected Australia-to-Hawaii jet service:

No scheduled flights on the route this year.

The Comet service was planned to start last April, but after the Karachi crash, the carrier said there would be some delay. CPA is getting only one other Comet 1A this year and notes that "it is not feasible to operate a scheduled service on this basis."

• **Reduction in financing** of excessive lead times: $1.6 billion.
• **Elimination of combat planes** for a small reserve: $233 million.
• **Reductions by AF** in jet spare engines: $165 million.

These reductions, totalling $4 billion, were offset partially by these additions that totaled $1.1 billion:

• **Financing of excess lead time** left in the revised budget: $847 million.
• **Additional pre-production costs** put in revised budget: $100 million.
• **Contingency for procurement** of long lead time items put in the revised budget: $56 million.

This discloses that Wilson's net reduction for the financing of excessive lead time is $800 million. Of the $1.6 billion taken out, $847 million was put back in.

$50 million more for ground-powered and electronic equipment.

The $3.56 billion—including $625 million recommended by the Administration for fiscal 1954—that will be available for financing major procurement other than aircraft, as of July 1, will finance the program for four years at a spending rate of $75 million a month.

The spending rate for fiscal 1953: $54 million a month.

The $50 million requested by Vandenberg would add 20 days to the advance financing period bringing it to four years and 20 days, Wilson said. "If the $50 million of ground-powered and electronic equipment for which this amount is requested is required, it can be financed without difficulty by slight adjustments within the sum of $3.6 billion which would be available."

$600 million more for maintenance and operations:

The Wilson budget allows $3.2 billion, amount used this year.

"These economies, both in overhead and improved supply distribution," the Secretary declared, "which should enable the Air Force to get along next year on the same amount of money as was used this year."

He pointed to repeated directives from the last Democratic-controlled Congress for reductions in this area of AF activity.

Wilson recited this accounting of fiscal 1953 maintenance and operations funds:

USAF requested $5.8 billion. The $4.4 billion allowed was cut $667 million by the House. Despite USAF protests that this cut would "necessitate a critical slowing down," Senate made an additional $200-million cut. Of the $3.6 billion finally voted by Congress, only $3.2 billion was used by USAF for maintenance and operations.

"In other words," Wilson commented, "although the Air Force actually needed only $3.2 billion this year, it insisted that the appropriation of anything less than the $4.4 billion in the budget would have 'critical' effect on the operations of the Air Force. Some of the same dire consequences are now threatened unless we appropriated $600 million more for fiscal '54 than was actually used this year."

$172 million more for military personnel.

Air Force's plan for utilization of the 970,000 level of military personnel provided for in Wilson's program "included excess numbers of military police, bandsmen, administrative personnel, personnel specialists, career specialists, chauffeurs, base maintenance and related types of personnel such as grounds keepers and grass cutters." By making substantial reductions in these areas, Wilson says, it will be possible to keep pilot training and other necessary programs at the desired levels.

$260 million more for base construction.

As with other USAF programs, Wilson contended that the base construction program is "over-financed." Whatever goal in air wing strength is decided upon, he said, could be financed with the money surplus on hand. With the $400 million in new money asked for fiscal 1954 in the Wilson budget, the Defense Secretary reported, USAF will have $3 billion in unexpended funds for financing for several years and $2 billion available for new contracting as of July 1.

USAF Axes Kaiser Aircraft Role

Contract cancelations halt firm's C-119 production and eliminate all but "a handful" of C-123s.

Air Force Secretary Harold Talbott last week announced cancelation of the C-119 Kaiser Motors Corp. contract while Henry J. Kaiser was presenting a stinging rebuttal to criticism of Willow Run C-119 production before a Senate Armed Services Investigating Subcommittee.

The USAF Secretary also announced cancelation of the C-123 contract with Chase Aircraft Co., 49% owned by the Kaiser firm. An Air Force spokesman said, however, that "a handful" of C-123s would be left in the program (AVIATION WEEK June 8, p. 14).

Investigation of Chase's performance on the C-123 contract was next on the Senate subcommittee's agenda.

Another Kaiser firm, Kaiser Aluminum and Chemical Div., took the brunt of USAF's cutback in the heavy press program (see p. 14).

Kaiser continues in production of the R1300 aircraft engine, under license from Curtiss-Wright Corp. Under subcontract with Boeing Airplane Co., the firm is machining forgings for the B-52 program and, under subcontract with Lockheed Aircraft Corp., is building subassemblies for the Navy P2V patrol bomber.

▶ **Fixed-Price Offer**—In canceling the C-119 and C-123 contracts, USAF disregarded Kaiser's offer made at a session of the Senate sub-committee: "In order to settle any further controversy as to the productive ability and efficiency of our company, the Kaiser organization is prepared to negotiate a fixed-price contract without redetermination for the completion of the C-119 work, provided that similar arrangements are negotiated for the prime contract on the C-123B assault transport."

Present Kaiser-Air Force contract for the C-119 Flying Boxcar is on a cost-plus-fixed-fee basis. Kaiser's offer to change the contract now was seen as a move to assure Kaiser Motors (new name of former Kaiser-Frazer Corp.) continued aircraft production activity. Edgar Kaiser, son of the firm's founder and president of Kaiser Motors, said recently that Willow Run had about 20% of its contract left.

▶ **Hits Fairchild**—The younger Kaiser revealed at the same time that the firm already has spent $70 million toward production of the Chase C-123B assault transport.

Chase Aircraft Co. is 49% owned by Kaiser Motors.

Henry Kaiser, board chairman of Kaiser Motors, lashed out at Fairchild Engine and Airplane Corp., developer of the C-119, charging that Fairchild all along had "attempted to sabotage and undermine" Kaiser's production of the C-119.

"Now," he added, "Fairchild is trying to get our C-123 contract, because they realize the C-119 will have but a short life since the C-123 suits the needs of today's Air Force better than the C-119."

▶ **Kaiser Costs**—Kaiser charged that Fairchild has been "dragging its feet" in supplying required technical assistance to Kaiser's second-source operation. Fairchild was paid $3,708,468 by Air Force to supply technical assistance in tooling up at Willow Run, he explained. He said the firm supplied tooling templates and drawings that were "obsolete, incomplete, delayed or inaccurate."

On the subject of costs, which earlier hearings determined were five times

that of Fairchild's in production of the C-119, Kaiser said:

"The impression has certainly been left in the public mind that Fairchild's cost per plane can fairly be compared with our costs. The $260,000 cost of Fairchild is after Fairchild has had the benefit of a government-owned plant, free of cost to Fairchild; a large portion of its tooling costs and plane re-arrangement costs written off on previous contracts; and learning experience gained on over 800 of the same basic type."

▶ **Fairchild Costs**—Here he referred to the C-82 which Fairchild originally developed as a cargo transport which preceded the C-119.

Fairchild's cost, he said, is compared with "Kaiser's cost of $1,200,000 per plane which is based on a privately owned plant, with all of the tooling and all the plant re-arrangement costs written off on a total of only 159 planes."

"No one brought out the fact," he said, "that if Kaiser built 800 or more of this basic type of aircraft, its cost would be $260,000 or less."

Another cost problem, said Kaiser, is the fact that "we are building C-119Fs," while Fairchild is building the C-119C. He told senators that approximately 30% of the F model is different than the C.

"There are some 80 changes required to develop the F model," he explained, "the major changes being different engines and a change from electrically actuated landing gear and control surfaces to a hydraulic system."

▶ **Model C Change**—Original award to Kaiser contemplated building the C model.

The change to the F model was ordered in January 1951, one month after the original contract was awarded, he said.

"Fairchild was responsible for furnishing Kaiser the engineering information on the change from the C to the F, but, complete engineering information for the F model was not received until a year after the time of the contract change. A number of the priming parts furnished Kaiser, by Fairchild, were C-119C parts and Kaiser had to modify them, when possible, to F parts."

Kaiser told the committee the C-119 contract award was strictly an Air Force proposition, that studies had been conducted for almost a year, in preparation for converting the Kaiser Willow Run plant to aircraft production.

Actually, Kaiser had expected to produce B-47s at Willow Run but, at the time, Lt. Gen. K. B. Wolfe, former Deputy USAF Chief of Staff, Materiel, decided the need for C-119 transports was greater because of the Korean crisis and Fairchild's Hagerstown, Md., facility was unable to meet Air Force requirements for the latter plane.

▶ **Disputes Testimony**—"It made sense for the Air Force to select a plant that had the tremendous 500-plane-per-month capacity of Willow Run. At Willow Run, the Air Force is buying something far more important than just planes, additional productive aircraft capacity, ready for use in an emergency," Kaiser said.

"Defense of America depends on its ability to produce large quantities of military equipment on a moment's notice when the emergency comes. This can only be done if the capacity to produce is in being before the emergency."

Kaiser disputed earlier testimony that costs of C-119 production at Willow Run increased as planes were turned out from an original estimate of $450,000 per plane to $1,300,000.

"The fact is," he said, "that Kaiser never submitted any estimate of $450,600. The fact is that the first Kaiser estimate for the number of planes actually being built, in the stretched-out schedule actually being followed, is the estimate contained in the definitive contract for 159 planes. This estimate totaled $179 million."

▶ **Explains Costs**—A revised estimate was made in May this year, he pointed out, which totaled $198 million, an increase of 10%. He claimed normal increases in labor and material costs were responsible for "a portion of this increase."

As to several specific items which Kaiser reportedly had charged erroneously to Air Force, Henry Kaiser said:

"We never asked the Air Force to pay for any of our interest expense . . . to pay for any part of the $60,000 mentioned as the cost of the dedication ceremony for the first C-119 . . . or to pay for vacations earned on automotive work. . . ."

House Vetoes Wilson Cut in Atomic Funds

Congress appears set to go along with the Administration's slowdown of atomic powerplant development, but the House has overridden Defense Secretary Charles E. Wilson's cancelation of an aircraft carrier atomic engine.

In voting coming fiscal 1954 funds for the Atomic Energy Commission, the House:

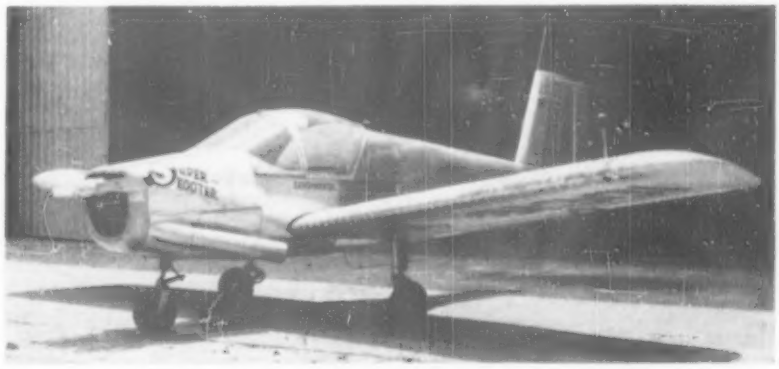
• **Okayed a $7.4-million cut** made by the Administration in the program for development of an aircraft propulsion reactor. The Truman budget's recommendation of $22.6 million was reduced to $15.2 million. In fiscal 1953, $17.7 million was invested in the program.

• **Earmarked $15 million** for development and construction of an aircraft carrier powerplant, which also might be utilized for the generation of industrial power. Of this, $5 million would be for research, $3.1 million for preparation of plans and $7 million for construction.

The Truman budget recommended a $28-million total for an aircraft carrier reactor, of which $16 million was for research and $12 million for construction. When Wilson revoked the "military requirement" for a carrier reactor, the project was canceled by the Atomic Energy Commission, resulting in $1.7 million cancelation cost.

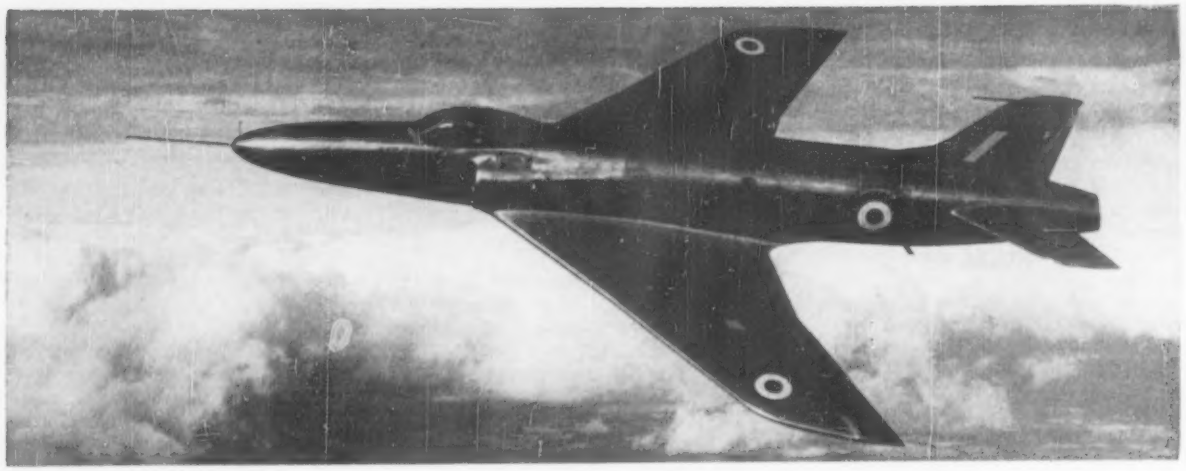
At House Appropriations Committee hearings, it was developed that a single-purpose industrial reactor, built without consideration for space, would not be adaptable to shipboard use but that a plant for carrier use also would be adaptable for industrial use. The House directed AEC to develop the latter.

The total estimated cost is $125 million, compared with $100 million for the single-purpose unit.



THORP TESTING NEW PRIVATE PLANE

First view of the new Thorp Super Skooter, a two-place all-metal private plane being tested on the West Coast. Its designer, John Thorp, has been polling the industry as to the possibilities of marketing the plane as a knocked-down kit which purchasers would assemble. Though resembling the 65-hp. Sky Skooter which first flew in 1946, the new plane appears to have a larger engine and is fitted with a Fletcher jet exhaust. Fuselage turtleback on earlier Skooter was lower than on this plane.



RAF Picks New Swift F.4 Over Hunter

By Nat McKitterick
(McGraw-Hill World News)

London—For several months the Royal Air Force has haggled over merits of its two front-line fighters—the Vickers Supermarine Swift and the Hawker Hunter. Both have been ordered; the Hunter has been bought in quantity by the U. S. under the off-shore purchase program in preference to the Swift. But until this week it has never been altogether clear which aircraft the RAF would support with large orders.

Now AVIATION WEEK has learned exclusively that the RAF has come down on the side of the new Swift F.4. The Swift F.4 is powered by a Rolls-Royce R.A.7R jet with afterburner rated at 9,200 lb. thrust. It mounts four 30-mm. cannon. A large additional order for Swift F.4s is expected soon. Some 375, including a few Swift F.1s, already are on order.

▶**U. S. Turned Down Swift**—In order to allow the RAF to make plans on the basis of firm delivery dates, the British government has asked Washington for assurance that the U.S. will not offer to buy Swifts under the off-shore purchase program except for delivery after 1956. This is a complete about-face from last fall when the British were willing and eager to sell the Swift for dollars. The U.S. turned down the Swift F.1 in favor of the Hawker Hunter on the basis of test flight reports written by USAF chief test pilot Maj. Gen. Al Boyd, who flew the Swift F.1 and the Hunter last November.

Nothing in the RAF decision merits the conclusion that the U.S. bought a pig-in-a-poke when it supported the Hunter. The facts are that after extensive, independent flight tests and technical evaluations by the RAF and the USAF, the U.S. chose the Hunter and the RAF favored the Swift (although Britain has ordered the Hunter, too). The RAF didn't make up its mind until after the Swift F.4 first flew back in March.

The RAF favors the Swift over the Hunter largely for one reason: It has extra tankage and therefore greater range. And otherwise RAF thinks the new Swift F.4 roughly equal to the Hunter. Therefore, RAF reasons the Swift is a slightly more flexible aircraft.

▶**Production Problem**—The Swift will be in squadron service later this year, a step ahead of the Hunter. First Swifts will be F.1s, which eventually will be modified into F.4s. Several Swifts are now flying and probably will appear in a formation at the RAF coronation review at Odiham July 15.

Production-wise, the Swift is a tougher problem than the Hunter, requiring more machining. But Vickers Supermarine management has set up an American-type production network of seven plants in the neighborhood of South Marsden, Wiltshire. These in turn are fed by an extensive subcontracting network, including plane-builders Short Bros. & Harland of Belfast and Folland Aircraft of Southampton.

When he tested the Swift F.1 last November, Gen. Boyd was disturbed by wing stall. He was very impressed with the Hunter's handling characteristics. When he was assured by Hunter designer Sydney Camm that the proposed addition of tanks, snuggled under the Hunter's wings, would bring up the range in line with the Swift's, Gen. Boyd gave the nod to the Hunter.

▶**A Better Swift**—Swift designer Joe Smith, meanwhile, was hard at work perfecting his F.4 to eliminate Boyd's objections. Wing fences appeared on the F.4, and wingtip stall disappeared, officials say. An Avon with afterburner was installed and power to the controls was boosted considerably. As a result, Vickers boasts the F.4 is "unsurpassed in speed, maneuverability and rate of climb."

Whatever the relative merits of the claim, the RAF has been swung over to the Swift.

The RAF decision is bound to have some effect on orders for Hunters. Hawker has in hand orders for about 500, placed originally by the RAF. But the U. S. is financing 450 and asking delivery by June 1955. That means a very considerable number of Hunters originally ordered by the RAF are going to have to be diverted to NATO via the U. S. off-shore purchase route. (In addition, the U.S. is financing part of the production of some 200 Hunter airframes at Fokkers in Holland and Rolls-Royce R.A. 7 Avons to go into them at Fabrique Nationale in Belgium.)

Two types of Hunters are on order, one powered by R.A.7 Avons, eventually with afterburning, the other by Armstrong Siddeley Sapphire jets rated at 8,600 lb. thrust. All U. S.-financed Hunters will have Avons. The first production Hunters are just coming off Hawker's production line at Squires Gate, near Blackpool.

CPA Plans DC-6B Flights to Hong Kong

Canadian Pacific Airlines has started flying from Hong Kong to Vancouver and plans to extend the service to the Orient-South America immigration market this September, using 82-passenger DC-6Bs.

CPA plans to fly over U. S. immigration red tape by going straight through from the Orient to South America via Vancouver, Mexico City and Lima. First flight was slated for June 28 with a DC-4.

Regular DC-6B service is scheduled for inauguration Sept. 25.

CPA took delivery June 17 of the last of four DC-6Bs on order. The carrier will receive two more DC-6As in August and September. These cargo planes are readily convertible to aircoach.

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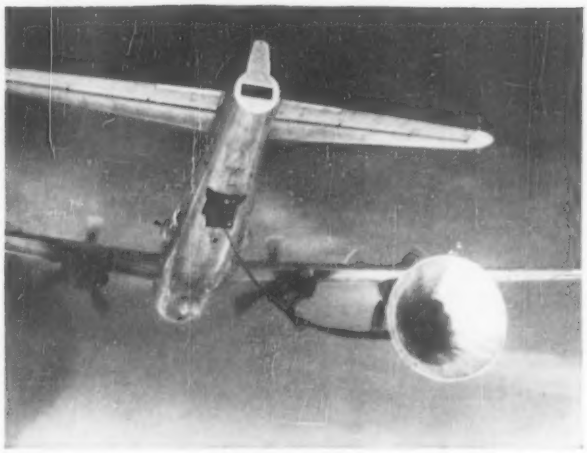

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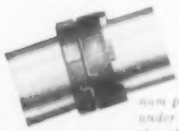

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AVIATION SAFETY

DIRECTORATE'S Flight Safety Research staff confers on aircraft accident reports.

AF Research Cuts Crash Rate

Flight safety specialists analyze accidents, educate crew members and suggest improved aircraft designs.

AVIATION WEEK's safety editor, Alexander McSurely, recently was granted authorization to visit Air Force's Flight Safety Research Directorate at Norton AFB, San Bernardino, Calif. In this story, he tells for the first time how, in three years, USAF's extensive research effort has resulted in a one-third improvement in flying safety.

By Alexander McSurely

San Bernardino, Calif.—If you save the life of a single Air Force pilot, it salvages not only his neck but the $60,000 it costs the USAF to train him.

So, if you save a $3.5-million Air Force B-36, plus its crew, you get into dollar economy that can mount rapidly into many millions.

And when this kind of saving is being compounded each year, as the U.S. Air Force safety record gets progressively better, there must be a reason.

You will find the reason at the headquarters of the Directorate of Flight Safety Research here at Norton AFB.

▶**Rate Goes Down**—A couple of days with Brig. Gen. Richard J. O'Keefe, the safety director, and his staff of experienced airplane and physiology specialists, give you a better idea of why the Air Force accident rate is dropping.

Like every serious safety group, the directorate tries first to find out what causes each accident, second to keep any similar accident from recurring. Both the investigation of the accident and the struggle to establish preventive action are tedious and painstaking jobs.

▶**High Return**—But the payoff, since the directorate was set up in 1950, has been at a rate of return per dollar invested seldom equalled anywhere, unless by a lucky Texas wildcat oil lease. Flight Safety Research doesn't have to save very many expensive airplanes and crews a year to amortize the relatively small annual investment.

▶**New 1953 Figure**—For the first quarter of 1953, the Air Force accident rate is down to 25.8 major accidents per 100,000 flight hours. And even though Air Force flew approximately 8 million flight hours in 1952, and is probably flying at a comparable rate now, that still adds to a lot of accidents. But any study of military aviation has to consider the type of missions flown, many of them very different from routine commercial peacetime flying.

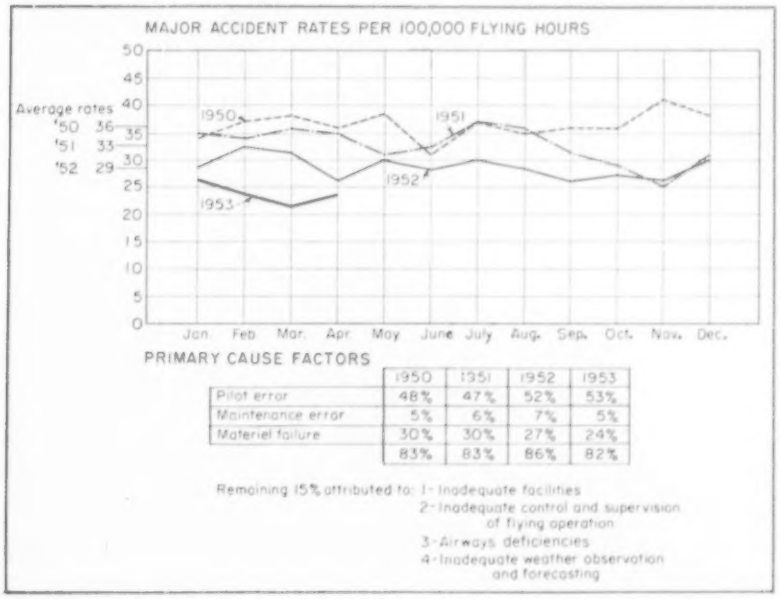
The new 1953 figure becomes more impressive when you learn it has come down progressively from 35 per 100,000 hr. in 1950, 33 in 1951, and 29 in 1952. That is how the dollar savings are being compounded.

In other words, if the 25.8 rate holds the rest of the year, the Air Force will have cut its major accident rate almost one-third in three years, despite a rapid upswing in hours flown in the same period.

▶**Four Factors**—Four principal factors enter into the Flight Safety Research program:

- **A trained corps** of investigators, senior pilots, engineers and physiologists, who go any place in the world to investigate and analyze a USAF plane accident if there is anything to indicate unusual circumstances.
- **A daily continuous** 24-hour reporting system by teletype on accidents from USAF bases all over the world and an elaborate system for filing and cross-referencing accident data received.
- **A group of resident technical representatives** from principal airframe manufacturers and regular frequent visits by nonresident technical representatives from other companies to aid in analyzing accidents and to pass back remedial suggestions to manufacturers for improved airplane design.
- **An active safety education program** carried on by special magazines and posters circulated throughout the global chain of USAF bases, to present safety problems and cures.

▶**Top-Level Support**—Behind this program is the weight of the Air Force's highest brass. The directorate is part of the Office of the Inspector General



	1950	1951	1952	1953
Pilot error	48%	47%	52%	53%
Maintenance error	5%	6%	7%	5%
Materiel failure	30%	30%	27%	24%
	83%	83%	86%	82%

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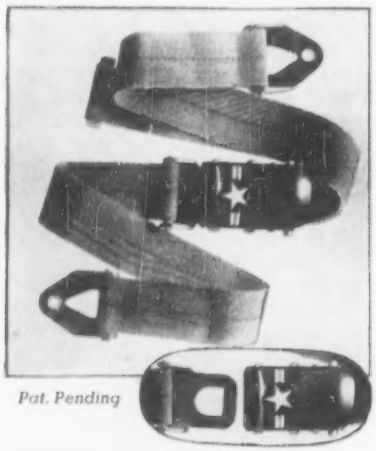

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Gen. Hoyt S. Vandenberg, retiring Chief of Staff, called in his top commanders at the time the directorate was setup, personally read them the "riot act" about giving flight safety the utmost cooperation, and has followed up with stiff admonitions.

But more important than the Vandenberg directives has been the actual payoff in lower accident rates which has won for Flight Safety Research increasing attention and respect at Air Force bases and within commands.

▶ **Round-Robin**—A day at the Directorate of Flight Safety Research starts with a round-robin staff conference in which the specialists detail various types of accident reports which have come in by teletype during the night. The director or his deputy assigns immediate action to be taken in each case.

When an AVIATION WEEK staff writer sat in on one morning conference, the day's reports included such variety as:

- **A student pilot** who slipped into the propeller of a Piper Cub trainer on the ground and lost a hand.
- **A Republic F-84** in a low-level gunnery run over the Gulf of Mexico dipped a wing in the water and was lost.
- **A minor accident** to a Navy R4D'8 (Super DC-3) reported by Navy liaison with the directorate.
- A series of follow-up reports on accidents reported earlier.

The reports are presented by officers who are specialists on fighters, bombers, trainers, cargo planes, etc., according to type of aircraft under consideration. The conference discusses probable cause, similar accidents on record, additional facts needed, before action is directed.

Procedure calls for preliminary reports on major Air Force airplane accidents to come into Norton AFB headquarters within six hours after an Air Force base learns of an accident.

Local base commanders are instructed to hold airplane wreckage secure 24 hours to give the Flight Safety Research's Investigation and Safety Engineering Division time to determine whether to send special representatives to participate in the investigation. In accidents with relatively obvious causes, the investigators accept reports from the local base's accident investigation board and flight safety officer. But whenever there appears to be a doubt, Norton investigators fly to the scene of the accident to make their own supplementary inquiries.

The investigation may require a team of specialists, including an airplane commander who is checked out in the type of craft which crashed, a physiologist to check into the personal factors involved in the crash, a technical representative from the company whose plane is involved, an engineer who will study structural factors.

▶ **Veteran Heads**—Col. Theodore Q.

CARGO PLANE safety specialists reach Packet accident before crash crew cleanup.

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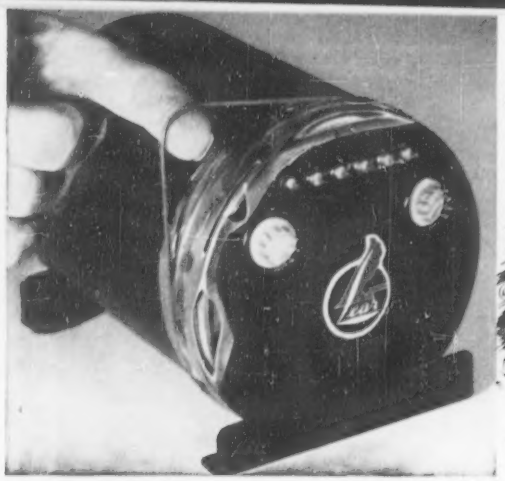

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Graff, chief of the Investigation and Safety Engineering Division, is a veteran four-engine pilot who led a B-24 wing in Italy in World War II and a B-29 wing in Korea, and headed the 10th Transport Wing at Patterson AFB before World War II.

Col. Francis S. Gabreski, U.S. jet ace in Korea and World War II ace with 31 enemy planes to his credit, is chief of the Combat Operations Branch.

The staff of investigator pilots includes some of the Air Force's most experienced flyers. Although the B-47 only recently has gone into squadron service, Graff has two Stratojet commanders on his investigating staff, as well as officers who are checked out as B-36 and B-50 commanders, and jet fighters, cargo, trainer and helicopter experts.

▶ **Engineering Staff**—Engineering branch includes specialists in jet propulsion, electrical and hydraulic systems, guided missiles, structures, propellers, and three engineering monitors assigned to check new aircraft designs for deficiencies in safety features in engineering and mockup inspection and to analyze new and current aircraft for ways to improve their safety design-wise.

The safety engineers check over the Air Force handbook of instruction for aircraft designers, used for standardized engineering practices by aircraft contractors, and make recommendations for revisions based on safety practices.

▶ **Design Briefs**—This spring the Flight Safety Research engineers started issuing design briefs, detailing good safety design practices based on their studies of accident reports. These are being made available on request to manufacturers who are Air Force contractors, to other government agencies, and to Air Force commands.

▶ **Company Participation**—Example of how the manufacturers' representatives assigned at Norton AFB work with the directorate in pushing the adoption of good safety design practices is seen in a recent outline of the Consolidated Vultee Design Safety Committee's work, submitted to the directorate by R. H. Brickley, Convair field engineer at Norton.

His principal duties are defined as:

• **Review past accidents** involving design deficiencies in all types of aircraft. Make sure pilot error is not actually caused by design error.

• **Study presentations** on design safety and accident causes made by the directorate and analyze how these apply to Convair designs.

• **Review current accident** reports and confer with directorate personnel on safety design recommendations.

• **Accompany investigation** of B-36 accidents and review causes for design deficiencies.

• **Make weekly reports** to Convair-Ft.

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NEW JERSEY

How Alternator *BURN-OUTS* can be *Eliminated* with New Alarm System

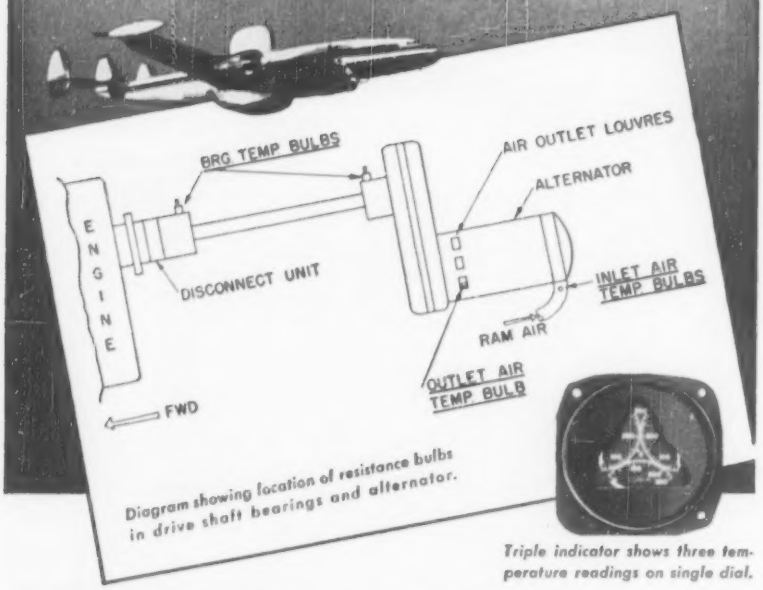

Diagram showing location of resistance bulbs in drive shaft bearings and alternator.

Triple indicator shows three temperature readings on single dial.

Lockheed and Edison engineers jointly developed this new Temperature Alarm System to eliminate burn-outs and bearing failures in the high speed alternator drive system of the RC-121C and WV-2 aircraft. After alarm the entire alternator drive system can be immediately disconnected.

This new Alarm System utilizes the same type of EDISON components which already have given years of dependable service in aircraft throughout the world. Standard tip-sensitive electrical resistance bulbs are placed in the drive shaft and gear box bearings to detect an early temperature rise which might lead to a bearing failure. The sensitive part of the bulb penetrates the housing and actually bears directly against the bearing race so that the slightest temperature increase is felt immediately and indicated on the left and right-hand scales respectively of the triple panel indicator.

Because of critical space limitations in the alternator itself it was decided to measure the differential temperature across the inlet and outlet air passages. Two bulbs in the inlet air duct are compared to a single bulb in the outlet air louvres and the differential temperature is indicated on the bottom scale of the panel indicator. The primary purpose of this arrangement is to detect a temperature rise due to mechanical failure with the added advantage of detecting electrical overloads. This added safety feature presents the possibility of preventing complete shut-down by reducing the alternator load.

An integral automatic alarm circuit completes the system so that the crew is alerted by visual warning well in advance of any danger from critical temperatures.

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PLAQUE is awarded to USAF units with outstanding safety records.

Worth for use of Plant Design Safety Committee and return monthly to Ft. Worth to discuss design items at committee meeting.

Four other full-time technical representatives at Norton who perform essentially similar functions for their companies: E. E. Knouse, Douglas; L. W. Giffin, Boeing; Richard L. O'Connor, Fairchild, and William Bartha, Lockheed. Representatives of 10 other manufacturers make weekly visits to the base for similar technical liaison on safety design, and many other companies' representatives are visitors.

Supplementing its own technical staff, the directorate is free to call on Air Research and Development Command and Air Materiel Command engineers for their views on technical problems. One of the most effective means of spreading the safety doctrines technically is by circulation of accident reports and recommendations to the two technical commands and to other commands throughout the Air Force, with requirement for comments and recommendations for measures to prevent similar future accidents.

Non-concurrence by some of the operating commands on grounds a safety recommendation is not practical operationally often provokes another "go around" in the directorate, which ends up in a compromise recommendation aimed at getting the safest airplane practicable to attain its mission.

Ansett Refused Aid

(McGraw-Hill World News)

Melbourne—Australia's third largest airline operator, Ansett Airways Pty. Ltd., has been refused government aid in acquiring new aircraft. This marks another instance where the government has turned down financial support to privately owned carriers.

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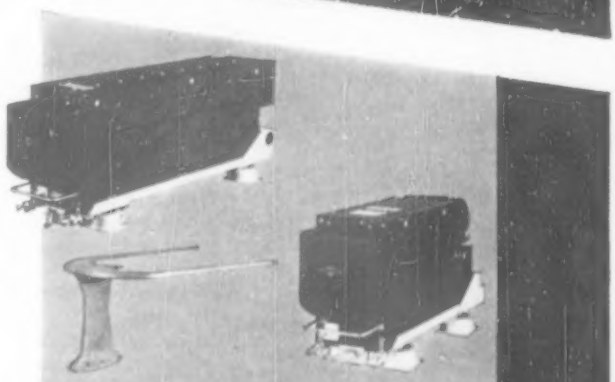
Collins 51R-3 Navigation Receiver, 51V-2 Glide Slope Receiver and 37J Omni Antenna are among the many Collins equipments in constant use by these and other prominent airlines. Wherever you find airline service you'll find Collins equipment — the standard for accuracy and dependability everywhere.



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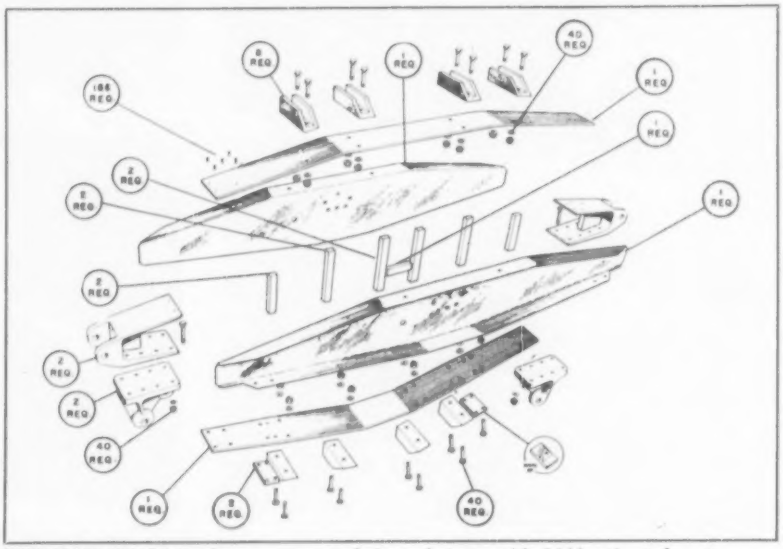
Forum Answers Heavy Press Questions

- **Large forgings, castings pose many problems.**
- **SAE meeting analyzes them, looks into future.**

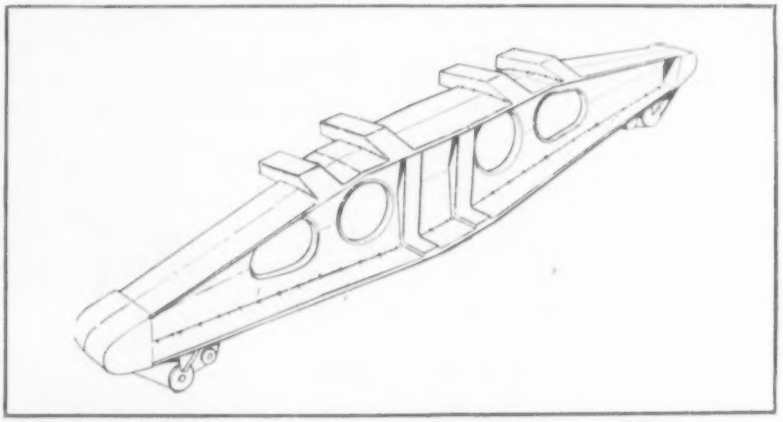
The men who must help translate today's and tomorrow's aircraft and engine structures from drawing board to reality recently met for a panel discussion with designers, parts and materials suppliers, metallurgists and other industry personnel for a broad analysis of large forgings and castings.

Presiding panel members* correlated the discussions which were part of the production forum held during the National Aeronautics Meeting of the Society of Automotive Engineers, in New York.

Some of the more important questions and answers studied at the meeting are briefed here.



BUILT-UP BEAM involves many parts, bolts and rivets, with $444 estimated cost.



FORGED VERSION is large single piece, estimated at $298 based on 500 pieces.

Forgings

• Is over-emphasis being placed on the use of large light-metal forgings in aircraft?

No—many people close to the problem believe that even greater emphasis is needed. In today's aircraft more and more performance has to be built into less and less space. This has called for new design thinking, new manufacturing techniques.

Many aircraft builders have turned to large forgings—made on the existing 18,000-ton press at Wyman-Gordon Co.—for a partial answer to these problems. Large forgings having high strength-weight ratios make possible designs not otherwise considered producible, while at the same time experienced users cite large savings in manhours and materials resulting from less machining and simplified assembly.

Many believe that the liberal use of large forgings would be the only practical way to mass-produce modern aircraft in an emergency.

• Are aircraft designers thinking in terms of large forgings and extrusions?

Yes—a recent survey of 18 aircraft companies on the West Coast and in the Southwest indicated widespread and practical interest, as evidenced by designs actually on the drafting boards and in the procurement stage. Similar interest is reported on the part of the Midwest and East Coast builders.

Many aircraft companies are and have been using the largest forgings and extrusions obtainable, and expect to use larger units when the new presses are available.

• Will aircraft designers be able to get from the large presses the kind of product they want?

There will be limitations on what can be produced. At this stage, even the experienced press operators must base their estimates on extrapolation of data secured from the operation of the smaller presses.

On a 50,000-ton press, operators believe that forgings of average complexity having 3,000 sq. in. projected area can be made. Actual forgings may be larger or smaller, depending on relative difficulty of forging.

Among the more urgent requirements of the aircraft designer are closer dimensional tolerances, thinner webs,

*G. W. Motherwell, vice-president manufacturing, Wyman-Gordon Co.'s Worcester Div.; J. R. Dousiin (panel secretary), superintendent, Wyman-Gordon's Grafton plant; Alexander Zeitlin, vice-president, Loewy Construction Co., Inc.; W. C. Schulte, chief metallurgist, Curtiss-Wright Corp.'s Propeller Div.; Frank Herlihy, chief metallurgist, American Brake Shoe Co; W. A. Dean, chief metallurgist, Aluminum Co. of America's Cleveland works; G. D. Welty, product manager, Alcoa's Forging Div.; Gerhard Ansel, Technical director, Dow Chemical Co.'s Madison Div.; Paul P. Zeigler, director, Kaiser Aluminum & Chemical Corp.'s Metallurgical Research Div.

New Problems

The forging and extrusion of supersize aircraft components, together with modern casting requirements for raw material and parts, will introduce new problems for industry teams, as Aviation Week has reported in the past. These difficulties are being anticipated—new techniques have been developed and thinking projected to bring satisfactory solutions.

Aviation Week continues its extensive coverage of these heavy press and casting problems with this presentation—information stemming from industry engineers who are close to the practical picture and whose job it will be to tailor designs and techniques to take full advantage of a new era in machine, aircraft and engine potential.

and smaller draft angles. Press operators face the fact that these factors tend to move in the wrong direction as forgings get larger. But they believe that better die lubricants, better die materials, more rigid press structures, use of die quenching where applicable, and other improved manufacturing techniques already well along will more than offset the size factor, and result in larger forgings to closer tolerances.

Aircraft designers must think at least five years ahead. They must continually ask for more than is presently available, in order to stimulate progress. An example of a recent accomplishment resulting from such thinking is the successful production of a tapered steel tube extrusion, with section as thin as ¼ in., useful in manufacturing propeller blades.

• How will the rigidity of the new forging presses affect forging tolerances?

Principal effect of higher rigidity will be better die closure. This will make possible better control of forging thickness and minimize thickness variation from edge to center of the forging. This improvement will be particularly helpful in assisting development of such items as integrally stiffened, thin-skinned wing panels and other similar parts.

• Can an aircraft manufacturer afford the cost of forging dies if only a few pieces are wanted?

Dies can be amortized economically in many cases in as few as 15-20 sets of forgings. Where prototype forgings are wanted in quantities of only 4 to 6 pieces, limited tooling (less costly) will frequently suffice to produce a blocker-type forging suitable for the first few pieces. Such forgings offer many advantages over hogging out of slab because of better grain flow and properties, and less machining.

One forging vendor reports promising results with cast Kirksite dies reinforced with steel, for producing small quantities of blocker-type forgings. This method, if successful, promises even lower tooling costs for prototype quantities.

• Will the use of higher die temperatures during forging have a beneficial effect on the producibility of large, light-metal parts?

Die temperatures of at least 500F are considered essential. For many thin sections, die temperatures as close as possible to stock temperatures are desirable. At present, a practical top limit appears to be about 800F. Above this, adequate die lubrication is difficult, and the strength of standard die materials begins to be affected.

• Will cast steel dies be used for the large presses?

This consideration is currently under study. There should be a place for them if they can be produced with enough strength and ductility, in sufficiently large sizes, and to sufficiently close tolerances. The maximum weight reported as having been produced by one foundry was 8,000 lb., to a tolerance of .002 in./in.

Larger blocks require better refractories and binders in the mold materials, than are currently available, if close

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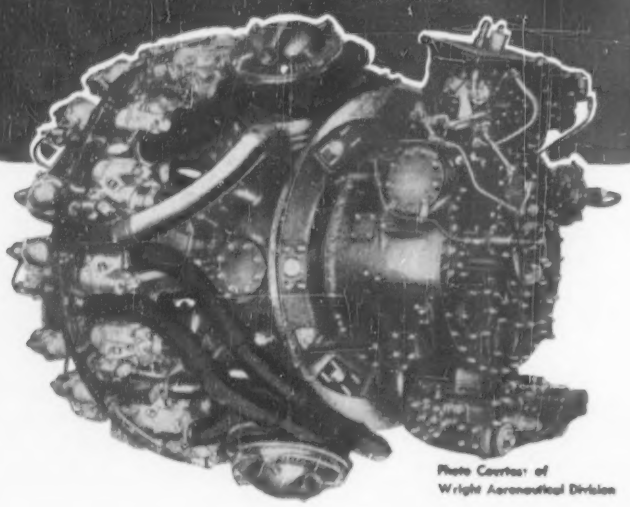

Photo Courtesy of Wright Aeronautical Division

The old saying "A chain is no stronger than its weakest link" might easily be the axiom of aircraft design. No unit of the compound reciprocating engine is more significant for its efficient service than the lowly exhaust pipe.

Smith-Morris is proud of its contribution to the success of the Wright Turbo-Cyclone "18". In the field of high temperature sheet metal fabrication Smith-Morris quality assures dependable and trouble-free service. Our experience may offer a solution to your fabrication problem.

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tolerances are to be held. Press operators feel that impression tolerances must be close if much die-sinking time is to be saved, and that available sizes must be much greater than the 8,000 lb. mentioned, if they are to be useful for the large press forgings.

• What is being done about getting actual orders on the books for parts to be produced in the large presses?

Press operators are working with designers and builders to promote the development of large forging and extrusion applications. The Air Force, too, is urging builders to utilize the new tools.

It is reported that the Air Force is prepared to authorize duplicate procurement of suitable items, thus assuring that plane production schedules would be met by the use of built-up structures, should unforeseen difficulties arise in utilizing the large integral parts.

Several operators report that they are overloaded on present equipment, which puts a limit on quantities and delivery schedules. The new presses will be utilized immediately on existing production to relieve this bottleneck.

Another important feature will be the combining into one piece of two or more large forgings now produced separately. Many of the designs originally worked out for production on the 18,000-ton press were found to be too large, and had to be split. On such items, re-combining into a single large forging is attractive because it requires no major design changes, and will save weight by eliminating one or more joints.

• Will raw material of adequate quality and size be available?

Aircraft builders are looking for something better than has been available in the past. All the major producers of rod and bar are working on the problem and some notable success has already been achieved.

• Will there be enough raw material for the tremendous capacity of the new presses to produce forgings and extrusions?

Magnesium-producing capacity appears adequate. Aluminum-producing capacity is being rapidly expanded, according to reports. A current scarcity of forging quality rod and bar is temporary.

• Assuming sufficient pig is available, what about facilities for converting it to ingots and shapes?

There are two main aspects to this problem—first, the making of a sound ingot; and second, transformation into shapes of maximum quality by the proper type and amount of work.

One producer claims much progress in producing an ingot up to 30 in. in diameter, which is virtually free of gas and porosity, as determined by gas

analysis, macro- and micro-examination, and sonic testing.

Another producer states that he has been working on the problem for a number of years and can now produce sound ingots in 14S and 75S up to 6,000 lb.; he has produced ingots up to 9,000 lb. experimentally, and larger ingots are in the program.

Another producer believes that sound ingots can be ruined by improper practice in reducing to wrought bar, and in forging. This company has done some work in rolling 18-in.-square ingots, using drafts of from 5 in. down to 1 in. It has been found that the lighter drafts work only the surface, stretch the center, and tend to produce unsound bar. The conclusion is that heavy drafts and as much total reduction as possible are necessary for sound rod and bar.

An Air Force contract is being procured to cover experimentation in and development of ways to reduce ingots to desired shapes and sizes, with highest quality. The methods to be studied include upseting, cross-working, cogging, drawing, rolling and extruding, in various combinations. It is expected that this work will be complete by the time the new presses are ready.

• Why isn't more use made of blanks cast to rough shape, then finish-forged to final shape?

This has been done, but it is a question of economics and quality. Present indications are that forgings made in this way will not be as strong or as ductile as if they were forged from bar.

Data supplied by one producer of magnesium forgings show that as cast the material has a tensile strength of 26,000 psi., yield strength of 12,000 psi., and a 6% elongation; cast and forged with a 10% reduction, the material shows 35,000 psi. tensile strength, 16,000 psi. yield strength and 10% elongation; the forged-from-bar unit shows 44,800 psi. tensile strength, 30,000 psi. yield strength, and 16% elongation.

• Which makes the best forgings, extruded or rolled stock?

The forging configuration might mean that one or the other would be better, according to one producer of forgings. Another producer states that it makes no distinction.

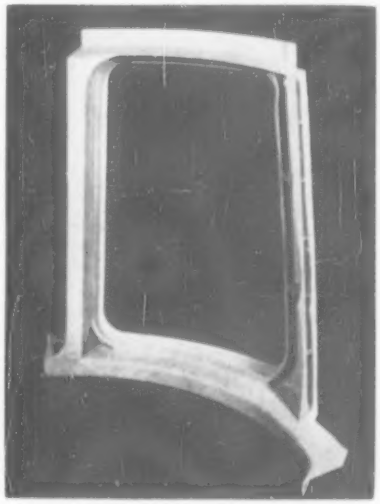
Producers of extruded bar feel that reduction ratios as high as 25:1 are desirable. On this basis, the capacity of present extrusion equipment places a limit on the size of extruded rods which could be made with this reduction. New extrusion equipment under construction will eliminate this restriction.

Castings

• What difficulties are experienced in casting steel of the 2512 type with 3% tungsten?

HUGE INGOTS will be key consideration in heavy press program products. Big metal chunks must be free of gas, porosity.

CANOPY TAIL, is example of thin-wall magnesium casting. Piece is about 20 by 20 in., weighs 6¼ lb., has ¼-in. wall.



WINDOW FRAME is another example of casting magnesium with thin wall. Metal thickness is 3/32 in., weight 2½ lb.

Soundness and porosity do not present too much of a problem. There is an end effect in which the grains solidify in a direction perpendicular to the mold wall. In many applications this has been found not harmful to performance. The material is susceptible to tearing, which presents a problem where fins must be cast.

• What can be done to reduce the variation in quality of aluminum castings?

Good aluminum castings of consistent quality are being made, but common-sense rules must be observed. First, do not ask the purchaser to order just any casting from any foundry. The engineering people at the customer's plant and at the foundry should get together and determine what is the best design and what is the proper alloy.

Second, quality castings should be made by a concern with adequate equipment, experience and personnel. High-strength casting alloys are more difficult to handle and require adequate control. For instance, proper use of X-ray inspection in the foundry will serve to show up the occurrence, and help in determining the cause of, imperfections. Such information properly applied will narrow the quality band.

• Why do castings sometimes have lower properties than the test bars, or even lower than are found in a properly cast ingot?

Test bars and ingots can be cast under conditions that approach the ideal. On the other hand, a shape may have many difficult configurations, changes in section, thin walls, etc., all of which call for higher skill to produce a sound part. However, a reputable foundry will see to it that the design and alloy selection are proper and that methods are used which will produce a part in which the relationship between test bar and casting is consistent and dependable.

• What is the size limitation on magnesium castings?

It depends on the part and the casting method employed. A 400-lb. undercarriage used in England is about 7 ft. long, with an average section of 1 in. Many castings are mass-produced today in the 100-150-lb. range. Another large casting is a 1,600-lb. base for a radar station.

• What are the minimum wall thicknesses which can be attained—can we get as low as .090 in.?

It is reported that a California company is having some success in this range. A 2-ft.-square magnesium panel has been cast with walls averaging .080 in. (AVIATION WEEK Dec. 29, 1952, p. 31, reported a magnesium casting with a wall thickness of .078 in.)

High-density alloys have not yet been successfully cast with a ⅛-in. wall, using normal practices. But it is reported that, using the frozen mercury process, 14-in. dia. rings with ⅛-in. walls have

been successfully made, and 20-in.-dia. rings are made with walls only slightly over ⅛ in. In SAE 4140 and Types 310 and 410 stainless, such rings can be made up to 36 in. in diameter.

• What about tolerances on these ring castings?

The higher the casting temperature required, the more difficult it is to hold tolerances. It is not just a matter of shrink. It is also a question of finding mold materials and binders which will withstand the high temperatures.

One foundry reports making thin-walled rings up to 2 ft. in diameter with a tolerance of ± ⅛ in. (.0625). Another foundry is making 36-in.-dia. rings to ± .030 in., but wall thickness is greater, ½-in. excess material being allowed on the inside diameter.

Using the frozen mercury or plastic processes, very close tolerances and thin walls are possible, although at present the size of such castings is limited.

• How are some of these limitations in wall thickness and tolerances being overcome?

By machining, in many cases. One promising method involves casting followed by rolling to thinner walls and to shape.

• Is it permissible to weld aluminum and magnesium castings for aircraft use?

Welding is permissible in low-stress areas, using the Heliarc process.

• Can light alloy castings be successfully impregnated?

High-vacuum impregation is done, using silicates or synthetic resins. In many applications the synthetic resins are preferred because they are more resistant to aircraft oils.

• What is the opinion on Zyglo inspection for non-ferrous castings?

It is presently the best method, according to one user. However, the usefulness of ordinary visual inspection should not be overlooked. With Zyglo, interpretation is important. The practice must be set to reveal genuine cracks without confusing the issue by revealing unimportant porosity and superficial folds.

• Where do castings find their most important field in aircraft?

Without a doubt, at present, in aircraft engines. These are high-grade aircraft quality parts. A tremendous field is developing for so-called "B" grade castings in the field of limited service, one-shot use, such as occurs in guided missile service. —IS

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Top production rate for aircraft in England—one every two working hours—is credited to the de Havilland factory near Chester.

Eleven different countries are taking delivery on the end products of five assembly lines at the big DH plant, the largest production facility in England.

The products: Comet 2 jet transports, Dove and Heron piston-engined feederliners, Vampire and Venom fighters and trainers.

New Firm Repairs Rejected Plane Parts

A recently organized firm at Seattle is concentrating on repairing vendor equipment rejected by Boeing Airplane Co. as unsuitable for installation in aircraft.

Boeing has been spending a reported $50,000 monthly in repairing some of these parts, but a majority has been returned to the vendor—collect. After rework, the vendor repackages the units, contends with increased paper work, and prepays the freight back to Seattle. In many cases, the freight handling and rework costs exceed the resale value of the returned unit.

While working at Boeing, H. F. Steere became aware of the situation and organized H. F. Steere & Co. to repair rejects, saving freight costs, time and handling. The company has worked in the past few months on various manufacturers' parts valued from $5 to

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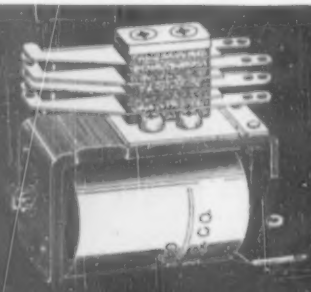
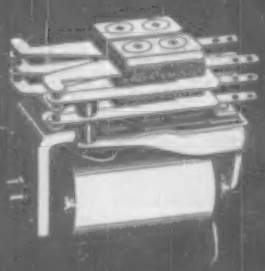


TYPE KX—Adds greater operating range and sensitivity with slightly longer coil.



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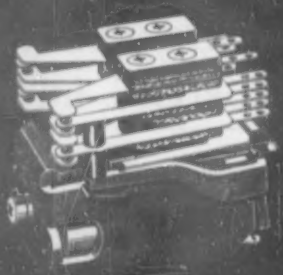

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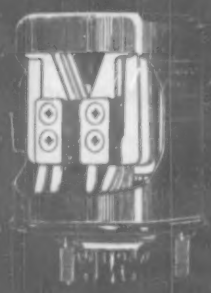

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Type N Relay hermetically sealed in steeled container... a feature available with all Clare relays.

CLARE pioneered the small-relay field with the Type K relay. Since that time it has been the mainstay of design engineers who must have a superior relay to operate in extremely small space.

The Clare Type K not only has the advantages of small size and light weight but it is capable of exceedingly fast operation, gives adequate contact pressure and is highly resistant to shock and vibration. Its long life and all-around dependability have enabled this relay to meet many complex engineering requirements.

In order to meet customers' specifications which the Type K would not quite fill, Clare engineers have developed three other small, light weight relays. All retain the basic operating and physical characteristics of the Type K. Two of them, the Type KX and the Type R, have the famous Clare reed armature suspension of special alloy. This has long been recognized as one of the subtler reasons for the superior performance of the Clare Type K relay.

The Type KX adds greater operating range and sensitivity by use of a slightly longer coil which can be safely wound to 8000 ohms resistance. The Type R adds still greater operating range and sensitivity by use of a coil not only longer but of greater diameter. The Type N relay is designed for operation on very low power. It employs a close-coupled magnetic circuit, generous use of magnetic iron and highly efficient coil design. This permits high sensitivity while retaining high contact pressure (minimum 30 grams) and adequate contact gap (minimum 0.0015").

All these relays are available enclosed in hermetically sealed gas-filled containers which increase their life, reliability and usefulness under extreme conditions of altitude, temperature, moisture, fungi, dust and dirt.

Clare sales engineers are located near you. For complete information call the nearest Clare office or contact: C. P. Clare & Co., 4719 West Sunnyside Avenue, Chicago 30, Illinois. In Canada: Canadian Line Materials Ltd., Toronto, 13. Cable Address: CLARELAY.

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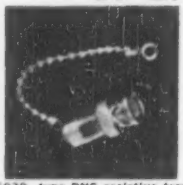

AI-11039, type BNC resistive termination plug. Weatherproof. Styrene Copolymer insert. Neoprene rubber gasket. Can be furnished with any desired impedance.

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AI-11072, Army-Navy type UG-21D/U, improved type N plug for use with RG-8, 9, 9A, 10/U cables. Weatherproof. Teflon insert, neoprene mating seal gasket, silicon rubber cable clamp gasket.

AI-11070, Army-Navy type UG-154/U, type LC plug for use with RG-17, 18/U cables. Weatherproof. Silicon rubber gaskets.

AI-11032, Army-Navy type UG-37A/U, high voltage pulse receptacle pressurized. Ceramic insert, neoprene rubber gaskets.

AI-11022, special type BNC high voltage plug. Mates only with high voltage receptacles and jacks, for use with RG-59/U cable. Weatherproof. Teflon insert, Neoprene rubber gaskets.

AI-11006, Army-Navy type UG-355/U Klystron Coupler. Weatherproof. Styrene Copolymer and linen base bakelite inserts. For use with klystron tube 726C.

AI-11030, Army-Navy type UG-306/U, type BNC right angle adapter. One male, one female end. Weatherproof. Teflon inserts. Neoprene rubber gasket.

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$5,000. Steere often calls on Boeing employees in their off hours for specialized rework jobs.

Steere estimates that 78% of all rejections are due to inconsequential, easy-to-fix defects or misunderstanding of drawing notes. Where rework is not economical, Steere salvages materials for the manufacturer.

Titanium Sponge Lack Holds Up Fabricators

Speedup in delivery of titanium products was considered at a recent meeting of the Department of Commerce's National Production Authority and the Titanium Producers and Fabricators Industry Advisory Committee.

The committee was told that producers and fabricators would soon be asked to reschedule deliveries to military contractors because of lag that has developed in production and delivery of critical items due in May and June.

Committee members attributed the delay, in part, to a shortage of titanium sponge. Expansion programs are being undertaken to increase the production of this material, government spokesmen said.

The expected 1953 output of 3,400 tons may be increased to an annual rate of 18,000 tons by 1956.

A fabricator task group reported that melting capacity already substantially exceeds the ability of titanium sponge producers to provide raw material.

Lockheed Extends Spot-Check Inspection

A spot-check inspection procedure is being extended to manufacturing operations at Lockheed Aircraft Corp., Burbank, Calif., after a long and successful run on the company's assembly line.

Introduced by the Air Force at Lockheed in 1950, the plan has saved materials, reduced delays. Initially tried on the T-33, the system has been broadened to include most assembly phases on both Air Force and Navy planes. Where AF inspectors formerly checked each plane, they now leave detailed inspection to company personnel and make only spot-checks.

With the new AF-accepted extension of the system, company will substitute spot-checks for piece-by-piece inspections only in those manufacturing departments qualifying for a "certificate of quality."

Certificates will be given to departments that are on schedule, have low rework records and have established quality-consciousness.

The theory is that placing a department on its own responsibility will improve quality performance.

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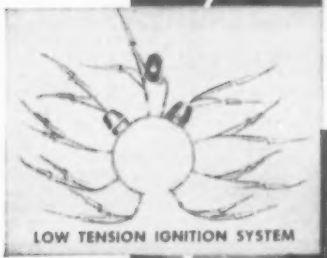

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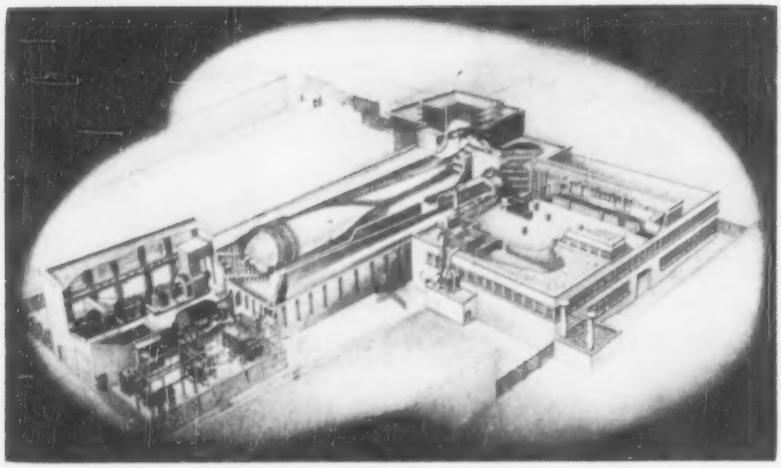


CUTAWAY reveals details of Boeing's modified windtunnel with new two-stage fan.

Boeing Triples Windtunnel Power

Boeing's big windtunnel is back in business after a $1.6-million modification job aimed at extending its usefulness.

More power, a new fan and an 8x12-ft. test section are the three major features which have enabled Boeing to push the tunnel operating speed from subsonic through sonic and into the low supersonic range.

As a result, it is the only privately owned test facility with transonic speed capabilities, a distinction to be added to the fact that the tunnel is also the largest privately owned test facility in this country.

▶ **Modification**—Boeing tripled the original power in the tunnel as the first step in the program. Westinghouse was called in to build a new 36,000-hp. electric motor which, coupled to the original 18,000-hp. unit, provides 54,000 hp. to blast air through the test section.

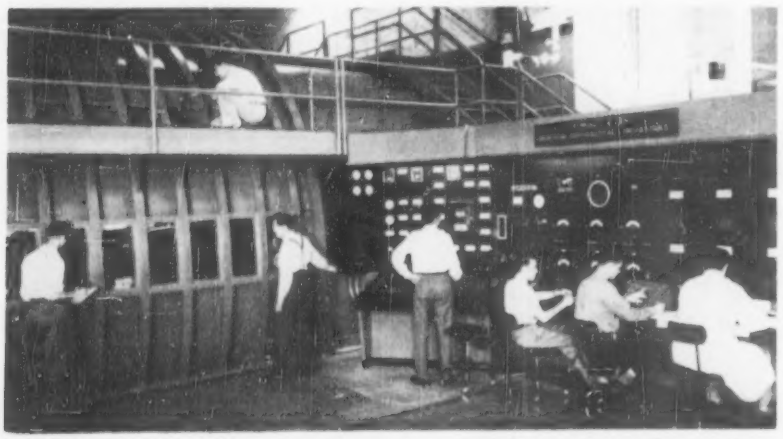
The new fan s a two-stage design, 24 ft. in diameter, with 36 three-foot blades to each stage. Blades are constru ted of laminated spruce covered with glass cloth; remainder of the fan is steel and aluminum.

The tunnel is a closed-circuit type; thus there is considerable heat added to the highspeed stream of air as it recirculates through the tunnel during a test.

A cooling air bleed has been designed into the modified tunnel to handle this, and in addition, heated air is scooped off and exhausted outside.

Basis for the modification of the tunnel was work done at the National Advisory Committee for Aeronautics, and disclosed by them to George Schairer, Boeing technical staff chief. (This could refer to the so-called "ventilated throat" which permits a tunnel to run at transonic speed continuously without the choking which would otherwise occur.)

This cooperation was a two-way street because Schairer was able to pass on an improvement used by Boeing which NACA will build into its largest and fastest transonic tunnel.



ENGINEERS watch highspeed windtunnel tests, check automatic recording of forces.

Navy Contracts

The following contracts were announced recently by the Navy's Aviation Supply Office, 700 Robbins Ave., Philadelphia 11.

Chandler-Evans Div., Niles-Bement-Pond Co., West Hartford 1, Conn., pump assy., 118 ea., $28,320.

Shulz Tool & Mfg. Co., 425 S. Pine St., San Gabriel, Calif., fuel valves and spare parts, $29,747.

Burner-Hollomon Mfg. Corp., 4706 Rhode Island Ave., Hyattsville, Md., engine stands, $34,630; engine overhaul stands and plate adapters, $56,108.

Leece-Neville Co., 5169 Hamilton Ave., Cleveland 14, maintenance parts for regulators on P4M aircraft, $41,218; a.c. generators, 68 ea., $142,979.

Bendix Products Div., Bendix Aviation Corp., South Bend 20, Ind., valve, 118 ea., $41,961.

Union Steel Co., 7301 Telegraph Rd., Los Angeles 22, engine stands for overhaul of airplane engines, $47,803.

Jack & Heintz, Inc., 17600 Broadway, Cleveland 1, control boxes, regulators & generators, $49,735.

Herman Nelson Div., American Air Filter Co., Inc., 1834 Third Ave., Moline, Ill., preheaters for aircraft engines, 73 ea., $50,339.

Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N. J., pump assys., 118 ea., $64,232.

International Engineering, Inc., 1145 Bolander Ave., Dayton 1, stands for overhaul and maintenance of aircraft engines, $21,406.

Douglas Aircraft Co., 827 Lapham St., El Segundo, Calif., maintenance parts for AD aircraft, $126,602.

Glenn L. Martin Co., Baltimore 3, maintenance parts for P5M aircraft, $61,883.

Lewis Engr. Co., 339 Church St., Naugatuck, Conn., indicators & bezels, $122,694; thermometer, 397 ea., $41,685.

W. L. Maxson Corp., 460 W. 34th St., New York 1, parts for aviation armament, $256,588.

Sherwin-Williams Co., 101 Prospect Ave., N. W., Cleveland, primer, 10,360 gal., $27,920.

Simmonds Aerocessories, Inc., 105 White Plains Rd., Tarrytown, N. Y., amplifiers, calibrators and connectors, $34,425.

Erie Mfg. Co., 300 N. 8th St., Milwaukee, cylinder assy., 1,890 ea., $34,776.

Transitron, Inc., 154 Spring St., New York 12, high voltage insulation, $10,577.

AiResearch Mfg. Co., Sepulveda Blvd., Los Angeles 45, actuator, 115 ea., $46,520.

Barber-Coleman Co., Rockford, Ill., actuator, 280 ea., $48,801.

Breeze Corps, Inc., 41 S. Sixth St., Newark 7, N. J., lead assys., $52,666.

Hewlett-Packard Co., 395 Page Mill Road, Palo Alto, Calif., meter, 168 ea., $54,912.

General Electric Co., 1405 Locust St., Philadelphia 2, generator, 200 ea., $96,654; indicator, master directional, 239 ea., $313,194; generators and exciter controls, $649,189.

Fairchild Engine & Airplane Corp., Stratos Div., Orinoco Drive & Manor Lane, Bay Shore, L. I., N. Y., cooling package, 49 ea., $105,390; supercharger assys., cooling packages, $799,498.

Hiller Helicopters, United Helicopters Inc., 1350 Willow Road, Palo Alto, Calif., transmission assy., 50 ea., $166,806; parts for H-23, H-23A & H-23B aircraft, $540,884.

Goodyear Tire & Rubber Co., Inc., 1144 E. Market St., Akron, wheel assy., 107 ea., $29,763; stationary disk, 55,936 ea., $115,955.

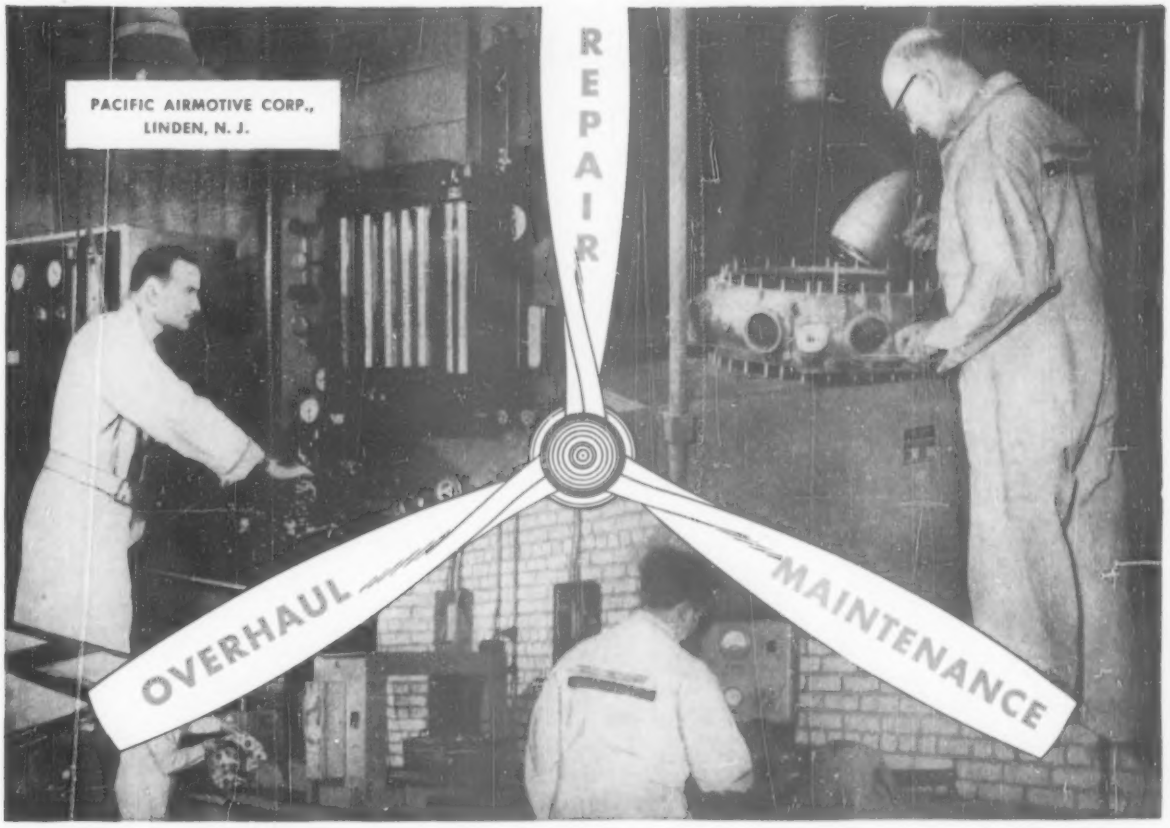
North American Aviation, Inc., Columbus Div., 4300 E. Fifth Ave., Columbus 16, Ohio, spares for SNJ aircraft, $88,748.

B. F. Goodrich Co., 500 S. Main St., Akron 18, block & shoe assy., 34,625 ea., $95,541.

Lear Inc., Romec Div., Abbe, Rd., Elyria, Ohio, motor assys. & pump assys., $105,351.

General Controls Co., 801 Allen Ave., Glendale 1, Calif., valve assys., $149,795.

General Motors Corp., Delco Products Div., 329 E. First St., Dayton 1, damper, 320 ea., $35,408.



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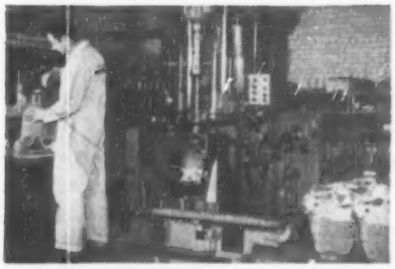

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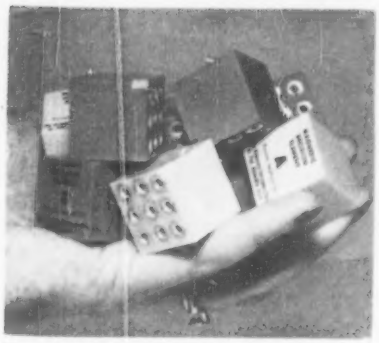
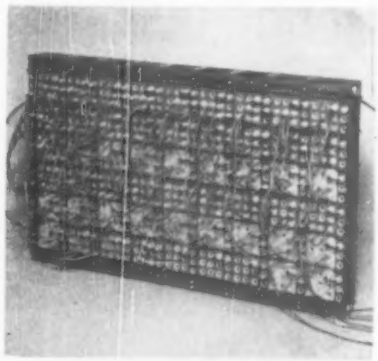


MAGNETIC blocks are used to build . . .



COMPUTER assemblies of any pattern.

Magnetic Blocks Aid Computer Design

Standard magnetic building blocks for making up computers were unveiled recently before scientists at a meeting at the Naval Ordnance Laboratory, Silver Springs, Md.

They look somewhat like children's building blocks and can be arranged rapidly in any desired performance pattern, the scientists were told.

The blocks, or Magnetic Decision Elements, were developed by Minnesota Electronics Corp. They are described as completely flexible, basic components which can be used to build speedily the entire arithmetic, program, control and memory sections of digital computers. The blocks are one inch square.

They can be employed for both serial and parallel systems, anything from simple flip-flops and binary counters to large-scale general purpose computers and digital differential analyzers, according to the firm.

The elements contain no electron tubes or transistors. They are cast in an epoxy-type resin for maximum resistance to shock and environmental conditions and lend themselves to volume production, for applications "where absolute minimums in weight . . . are of primary importance," the company says.

Use of the blocks will lengthen the useful life of computers, as they can be shifted around to meet new demands on the computer. The time cycle of design and construction of computers can be shortened to weeks, days and hours, instead of years using these blocks as the foundation of computing systems, the company claims.

Minnesota Electronics Corp., 47 W. Water St., St. Paul 1, Minn.

New Stainless Alloy Is Harder, Non-Galling

A new stainless steel alloy—V2B—has been announced by Cooper Alloy Foundry Co., Hillside, N. J. The material is reported to combine high hardness, non-galling characteristics and superior corrosion resistance.

It is a hardenable 18-8 type, containing copper, molybdenum, silicon and a very small amount of beryllium. It is reported readily machinable in the quench-annealed state and may be hardened by a low-temperature heat treatment, which produces no distortion and only a light tinting discoloration, readily removed.

In annealed condition, the material is easily welded, using special V2B welding rods.

The alloy does not overage at elevated temperatures, it is said. It can be produced in both cast and wrought form.

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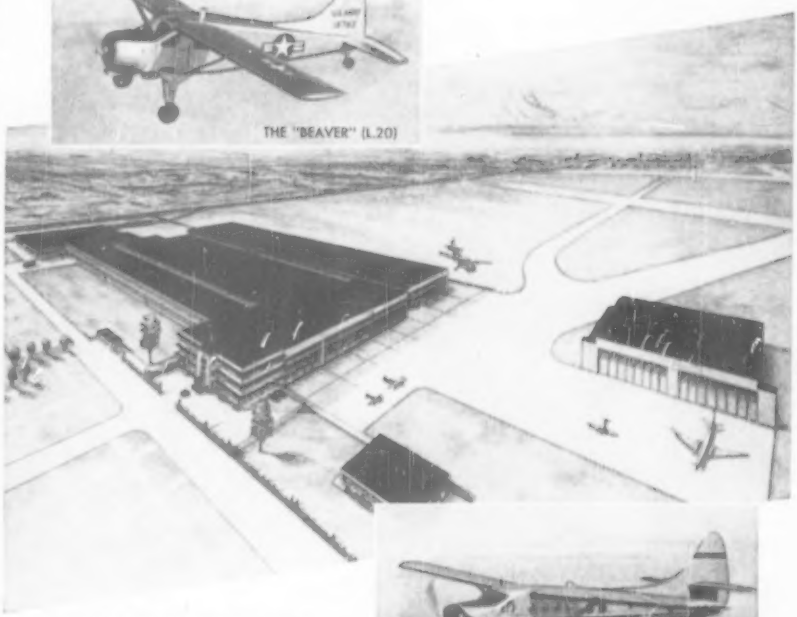

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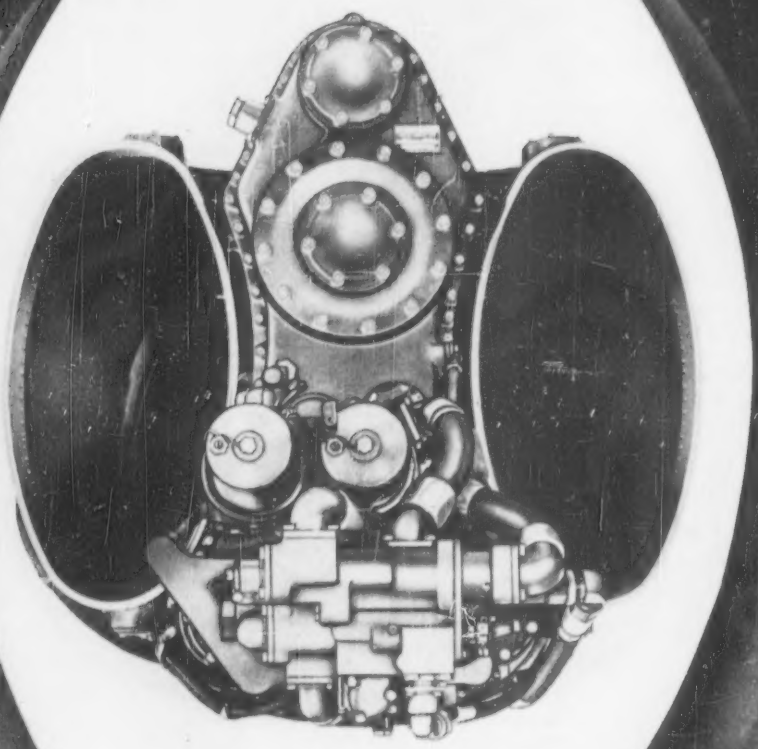
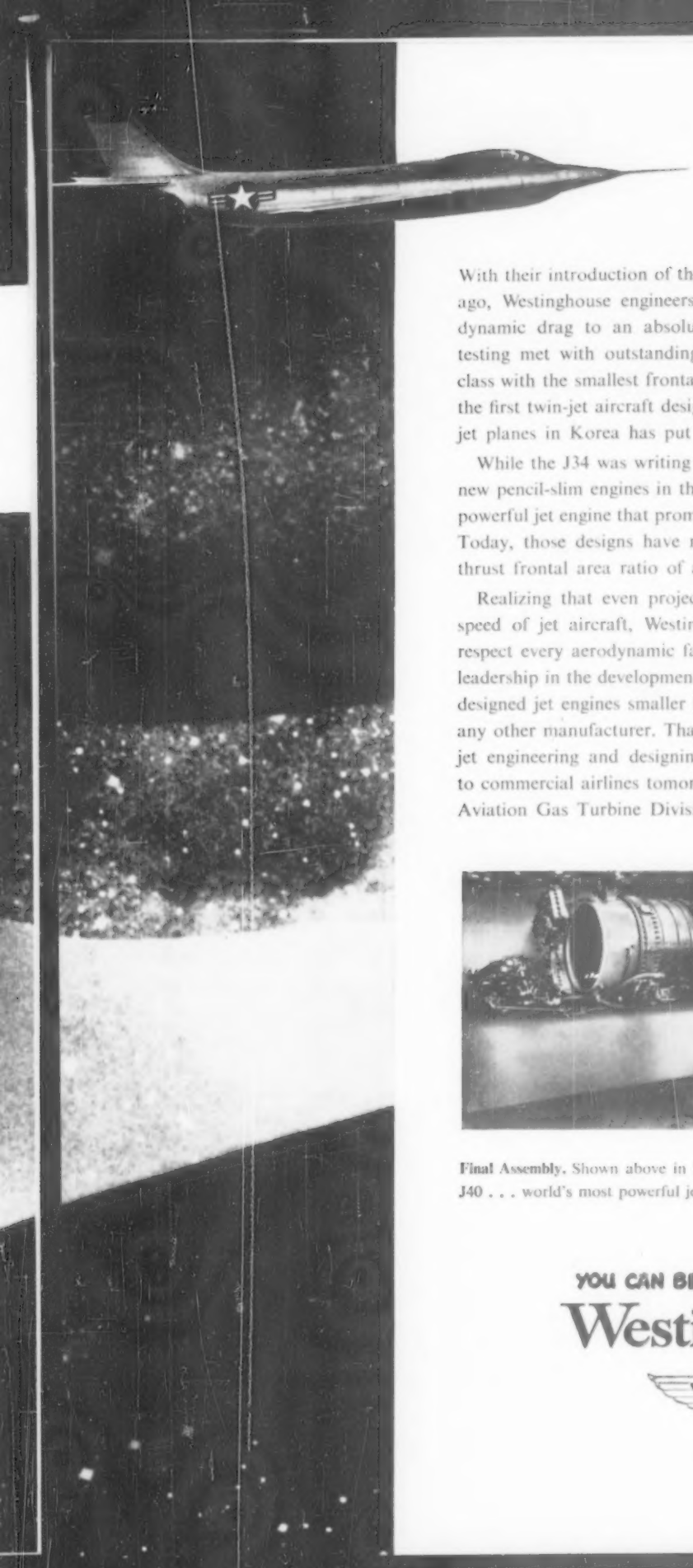
HIGHLIGHTS IN *Jet Engineering*

New jet engine designs further reduce frontal area



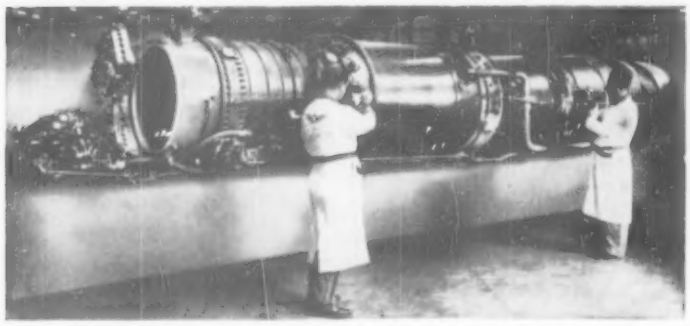


With their introduction of the first axial-flow jet engine over ten years ago, Westinghouse engineers expanded their efforts to reduce aerodynamic drag to an absolute minimum. Continued designing and testing met with outstanding success on the J34 engine, first in its class with the smallest frontal area per pound of thrust . . . permitting the first twin-jet aircraft design. The unequaled performance of twin-jet planes in Korea has put real meaning in that record.

While the J34 was writing jet history in combat, Westinghouse had new pencil-slim engines in their test cells . . . new designs for a more powerful jet engine that promised even greater latitude in plane design. Today, those designs have made possible the J40 with the smallest thrust frontal area ratio of any announced engine.

Realizing that even projecting rivet heads can have effect on the speed of jet aircraft, Westinghouse engineers know that they must respect every aerodynamic factor. That is why they have maintained leadership in the development of axial flow engines . . . why they have designed jet engines smaller in diameter for given power output than any other manufacturer. That is why they have acquired a wealth of jet engineering and designing knowledge that will prove invaluable to commercial airlines tomorrow. Westinghouse Electric Corporation, Aviation Gas Turbine Division, Philadelphia 13, Pennsylvania.

J-54014-A



Final Assembly. Shown above in the last stages of assembly is the Westinghouse J40 . . . world's most powerful jet engine, fully qualified for production.

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- **Sales and Engineering Office for the distribution and servicing of Giannini products in Europe.**
- **Research Laboratory and Experimental Shop for the development of new products originating in Europe.**

Inquiries are solicited from persons or organizations in Western European countries interested in handling Giannini products. Please submit full details as to territories covered, other products handled, organization and sales possibilities, by writing to:

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Lockheed Tunnel For Icing Research

A new icing tunnel scheduled for operation in August is now being constructed at Lockheed Aircraft Corp. to supplement the company's established weather-making research facilities.

Intended for testing wings, control surfaces, de-icer boots, engine heater air inlets, carburetor intakes, built-in antennas, radomes and other installations, the 9,600-cu. ft. tunnel will be serviced by a 1,165,000-Btu./hr. refrigeration system.

Misty spray and high-force winds will be available to duplicate flying conditions in ice-forming weather. The research device will test components at a simulated speed of 200 mph. at zero temperature, but higher speeds will be duplicated for the upper freezing range, and slower speeds at as low as −50F.

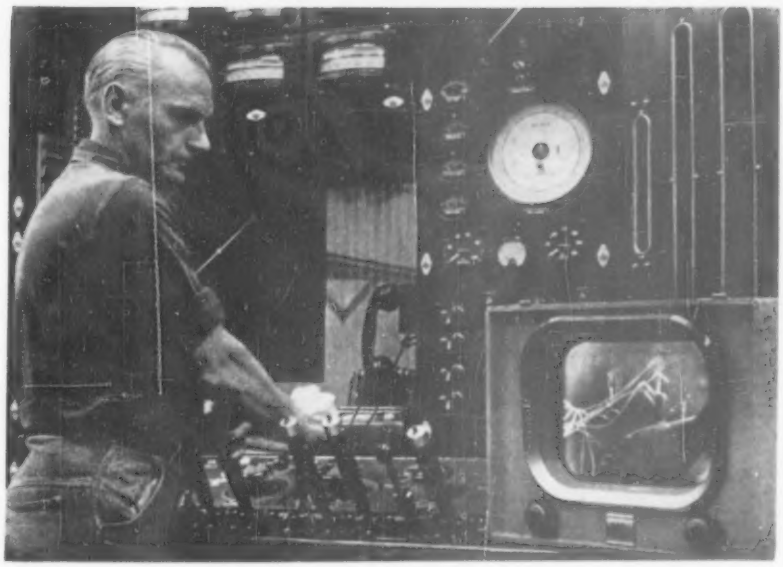
The tunnel will stretch 76½ ft. and be 17 ft. high. The test section will measure 10 sq. ft.

Fast Writeoffs

Accelerated tax amortization for manufacturers expanding their defense facilities is granted by the government in the form of certificates of necessity.

In the following list of recent certificates, company name is given, followed by product or service, cost of construction deemed necessary for defense expansion, and the percentage of the expansion cost allowed for fast writeoff. Fast writeoff permits property to be depreciated in five years.

- **Lockheed Air Terminal, Inc.**, Burbank, Calif., airport facilities, $67,148, 60%; $37,627, 60%; $27,925, 60%; $22,039, 60%; $6,450, 60%; $125,000, 60%; $52,500, 60%.
- **General Metals Co.**, Burbank, Calif., aircraft parts, $133,640, 65%.
- **Lockheed Aircraft Corp.**, Burbank, Calif., aircraft & aircraft parts, $91,522, 60%.
- **Airdraulics Co.**, Pasadena, Calif., aircraft parts, $10,456, 70%.
- **Northern Consolidated Airlines, Inc.**, airport facilities, $290,000, 60%.
- **Wien Alaska Airlines, Inc.**, Fairbanks International Airport, Alaska, airport facilities, $450,000, 60%.
- **Aviation Equipment Corp.**, New York, air transportation, $6,500,000, 80%.
- **Viking Tool & Mach. Co.**, Belleville, N. J., aircraft parts, $45,570, 70%.
- **B. G. Instrument Corp.**, Corona, N. Y., aircraft parts, $536, 70%.
- **Taber Instrument Corp.**, North Tonawanda, N. Y., aircraft parts, $72,579, 70%.
- **McMillen Grinding Co.**, Cleveland, aircraft parts, $10,150, 70%.
- **Borg-Warner Corp.**, Bedford, Ohio, aircraft parts, $41,771, 65%.
- **C&E Mfg. Co.**, Detroit, aircraft parts, $3,691, 70%.
- **A. B. Dick Co.**, Chicago, aircraft parts, $41,120, 65%.
- **Master Mach. & Tool Co.**, Chicago, aircraft & electronic parts, $72,099, 70%.
- **Hussmann Refrigerator Co.**, St. Louis, aircraft assemblies, $117,151, 40%.
- **Esso Standard Oil Co.**, Baton Rouge, aviation alkylate, $549,000, 100%, $290,000, 20%.
- **Mid-Continent Petroleum Corp.**, Tulsa Co., Okla., aviation alkylate, $433,428, 100%.



Now Showing on TV: Jet Tests

The application of television for scanning operation of gas turbines and components is being studied at Pratt & Whitney Aircraft's Willgoos Laboratory.

The television scheme is aimed to overcome difficulties in the present method of test cell viewing. Engines under test now are viewed from a control room through double glass panels. With the engine mounted in a fixed position, P&WA reports it is practically impossible, without television, to examine more than a small part of the engine at any one time through the restricted viewing panel.

Recent experiments with the TV setup may make it possible for the test stand operator to view the test engine from every angle just by scanning a standard television screen.

Permanent records of tests could be obtained by making moving pictures of the images on the receiver screen.

▶ **Technique Improved**—P&WA engineers first constructed a TV camera and accessories that showed promise, but indicated refinements would be necessary. Chief difficulty was the limited distance the picture could be carried by cable to the receiver. The coaxial cable used—a 2¾-in.-diameter unit—would carry a satisfactory image only about 35 to 50 ft. This was impractical in the large test cells of the Willgoos Lab.

P&WA engineers then resorted to a compact industrial TV camera to overcome this difficulty. A distortion-free picture is now carried as far as 1,000 ft. over a small coaxial cable of ¾-in. diameter.

Better lighting has brought improvements, too. Best results have been obtained by using banks of ordinary fluorescent tubes.

▶ **Mobile Units**—Only one camera is being used now, but if tests prove out, P&WA's engineers see batteries of cameras installed in a single test cell. A mobile setup is being considered so that cameras could be moved where needed for scanning at various angles.

Most of the experimental work has been conducted by a P&WA group headed by assistant project engineer Arnold Waterman, experimental test engineer Charles Wilkins, and development technician Ernest Amiot.

Test cell scanning by TV also has been studied by Wright Aeronautical. Wright conducted studies of TV viewing in color for ramjet operation at its Wood-Ridge plant a number of years ago, but flame definition was reported not to have been entirely satisfactory at that time.

PRODUCTION BRIEFING

▶ **Northrop Aircraft, Inc.**, Hawthorne, Calif., plans to put in new flight testing facilities at Palmdale Airport, Calif., at a cost of more than $2.5 million. The new facilities will employ approximately 700.

▶ **Western Sky Industries**, Hayward, Calif., is putting up a $125,000 two-story addition to its facilities. The firm recently delivered 100th Douglas AD Skyraider center wing assembly. It has a $10-million backlog.

▶ **Pastushin Industries, Inc.**, maker of Fluid-Tight self-sealing rivets, has moved to a new 5,000-sq. ft. plant at 501 North Prairie Ave., Hawthorne, Calif., near the municipal airport.

Solar Aircraft Co.'s new 300,000-sq.-ft. Wakonda, Iowa, plant is undergoing a $2-million expansion. Added will be 156,000 sq. ft. of manufacturing space and 60,000 sq. ft. in office and engineering facilities. Extra area is needed for increased output of jet engine parts, including assemblies for new P&WA J57 and Allison J71.

▶ **General Electric Co.**'s Silicone Products Dept. is getting new warehouse facilities at 427 W. Erie Blvd., Chicago, to provide better Midwestern service.

▶ **Boeing Airplane Co.**, Seattle, has abandoned its plan to advance summer working schedules by one hour (AVIATION WEEK June 8, p 43). Company says the shift would cause hardship for too many employes.

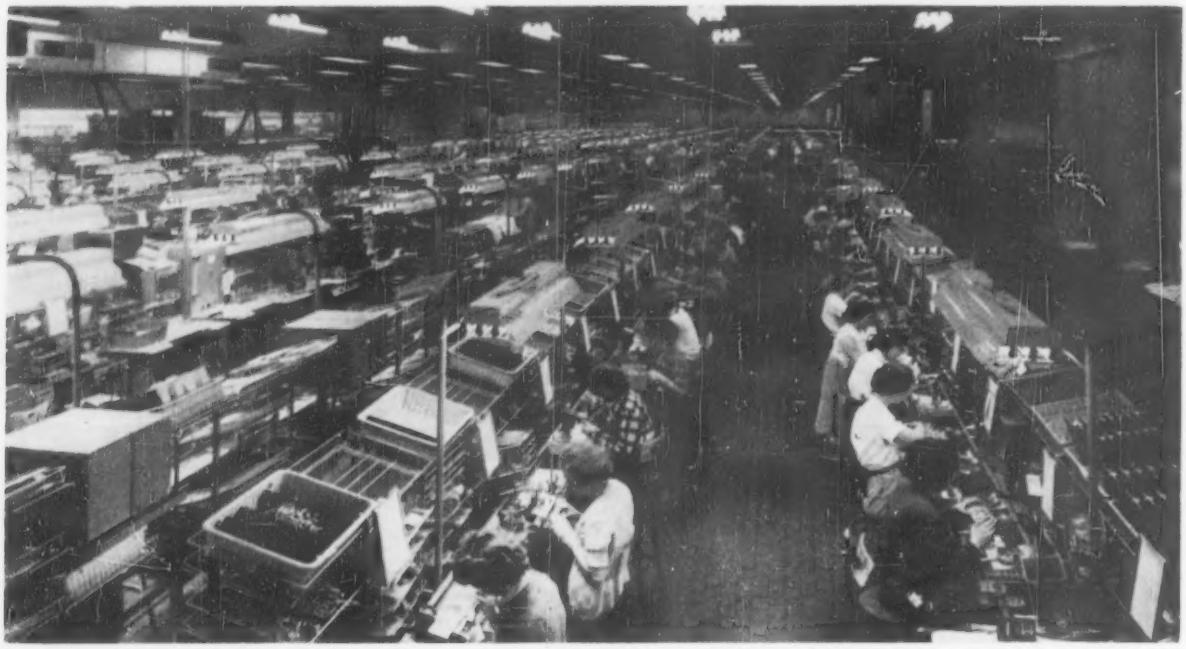
▶ **Lockheed Aircraft Corp.** has awarded $3.2 million in contracts for construction of three factory buildings at the USAF jet test center, Palmdale, Calif. Work is to be completed by mid-1954.

▶ **Electric Regulator Corp.**, Norwalk, Conn., which makes Regohm devices for electrical and electronic industries, is putting up a 2,100-sq.-ft. addition to its present plant. An auxiliary power supply is being installed to safeguard against failure of outside sources.

▶ **G. M. Giannini & Co., Inc.**, Pasadena, Calif., maker of servomechanism and computer components, has formed a European subsidiary, Giannini Italiana S.p.a., Alberto da Giussano 15, Milan, Italy. The subsidiary will provide headquarters for distribution and servicing of the parent firm's products abroad and maintain research experimental shop facilities for developing new instruments.

▶ **Magnaflux Corp.** has combined all its operations under one roof in a new 74,000-sq.-ft. plant recently opened at 7300 Lawrence Ave., Chicago. The new facility is nearly twice the size of the previous installation.

▶ **Knickerbocker Textile Corp.**, New York, has purchased all assets and goodwill of Aviation Engineering Corp., Queens, N. Y. The company will be known as Avien-Knickerbocker, Inc., and operate as separate divisions. Aviation Engineering makes electronic fuel gage systems and other devices. Leo A. Weiss, AEC's president, retains this position with the new firm and Jacob Granowitz, president of Knickerbocker Textile, is chairman of the executive committee.



LONG PRODUCTION LINE for complex and intricate avionic assemblies at Hughes' huge Culver City, Calif., plant depends on controlled flow of parts and sub-assemblies.

Hughes Aircraft Co. Accents the New

Young management, not bound by precedent, is willing to try novel ways and finds many of them pay off.

By Philip Klass

Culver City, Calif.—There is a freshness of approach and a willingness to try the new at Hughes Aircraft Co. which the visitor here quickly senses. The tangible evidence comes in the form of the novel manufacturing techniques employed throughout the neat, well laid-out plant where Hughes builds its complex interceptor fire control systems.

Less tangible, but none the less persuasive, are company policies and philosophies expressed to AVIATION WEEK by some of the top men at Hughes Aircraft.

For example, HAC does not limit the use of servomechanism techniques to the design of its fire control system and air-to-air missiles. The techniques of "closed loops" and "feedback" are applied widely to the organization of Hughes' manufacturing and engineering operations.

One interesting company practice is to bring seasoned field engineers back to Culver City and put them into design and development engineering groups. In this way field engineers can apply their knowledge of field usage problems to new equipment designs.

An interesting Hughes philosophy is the announced company policy of recognizing contributions of outstanding individual scientific workers with prestige and salary equal to those who hold technical administration positions.

▶ **The Reason**—The fresh and vigorous atmosphere at HAC is a product of several factors:

• **No precedent.** Corporate experience, which normally shapes a company's operations in the pattern of the past, didn't exist at HAC insofar as avionics and large scale production were concerned.

• **Bold management.** The young management team which Howard Hughes picked to run his company was willing and eager to try new ideas.

• **Source of ideas.** The scientific and production people at Hughes had come from a cross-section of U. S. industry, giving HAC a cross-section of U. S. industrial know-how. Cross-pollenization of this know-how at Hughes in turn produced new ideas.

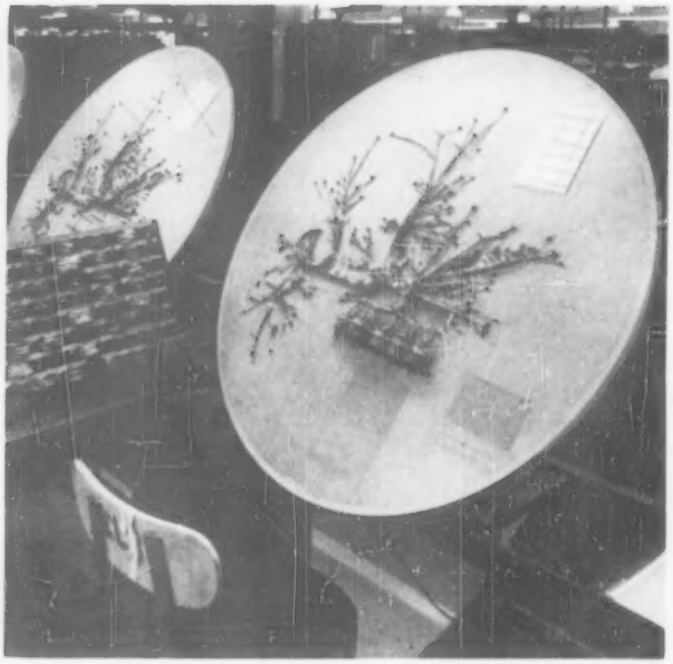
• **Wherewithal.** Multi-millionaire Howard Hughes provided HAC with the dollars needed to try out its ideas.

▶ **Shows Outside Influence**—Hughes' operations show the influence of the "industrial alma maters" of some of its men. The mechanized assembly and materials-handling techniques smack of the automotive industry. The environment in HAC's research and development labs resembles that in the resarch labs of Bell Telephone Co. and General Electric. Some of the new ideas in business organization and management had their origin in the Harvard School of Business Administration.

It would be unfair to suggest that Hughes merely borrowed ideas from others. It has pioneered techniques that have already brought old-line electrical manufacturers to Culver City for a look-see.

Tight Production Loop—Large phase lags in a servo system can cause instability. An equivalent "phase lag" in manufacturing operations results in high spoilage and low output. This equivalent phase lag is the interval between the instant that a machine or tool first begins to slip out of tolerance and the time that the resulting defective pieces are first detected at a distance inspection station and traced back to the offending machine or operator.

PRECISION inspection of fine-tolerance parts on the shop floor.



NEW TWIST in making electrical harnesses in rotatable circular board that cuts required production time sharply.

INVENTORY control calls for sharp thinking; a typical interceptor fire control system uses about 15,000 parts.

SIP BORING machine is one of foreign tools used.

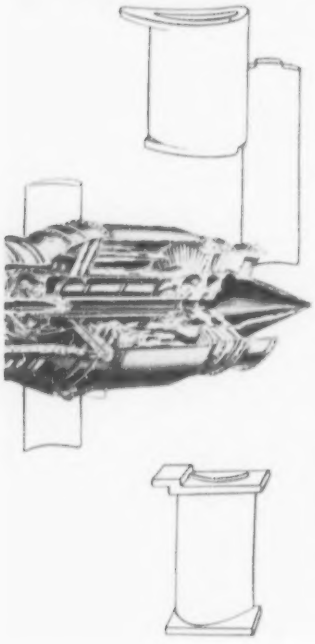
Hughes has tightened this loop by placing expensive gages and test fixtures on the shop floor so that precision-machine operators can inspect their work as soon as they take it off their "machines." "You have to discover your troubles at the time you're making them," is the way that R. B. Parkhurst puts it. Parkhurst is plant manager of the Electronic Manufacturing division which turns out interceptor fire control systems.

Parkhurst disagrees sharply with those in industry who are afraid to give precision gages to machine operators for fear they will damage or maltreat them. HAC maintains gage accuracy by removing all gages at the end of each shift and checking them against masters. After this the gages are sealed and then handed out to the same shift on the following day, according to Parkhurst.

On-the-spot inspection and a statistical quality control program, both instituted about a year ago, have cut overall spoilage to around 30%, dollar-wise, of total machine shop output, Parkhurst reports.

► **Tooling for Precision**—"We learned the hard way that old truism that you can't inspect quality into a product; you have to build it in," Parkhurst says. Some of the tooling required to fabricate radar and computer parts must be designed for tolerances of 20-millionths of an inch.

Many of the Hughes machine tools have been imported from Switzerland and Germany and include Sip hydroptic jig boring and milling machines, Tarex automatic screw machines and Hauser jig grinders. Many of the machines are



Oddly enough, the metal fabricating process first used to produce cobalt-chrome dentures helped put the "bite" into World War II bombers. The tiny power blades in the turbo-superchargers of high-flying B-17's and B-29's that provided extra speed and longer range were precision cast from high-temperature alloys by the unique Microcast Process.

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specially built to Hughes specifications, at premium prices.

Parkhurst pointed out a Fellows fine pitch gear shaver, built by selective fit methods and incorporating special cams, for which Hughes paid a 25% premium. To provide the super-quality which Hughes needs, this premium gear shaver is operated and only half its rated speed, Parkhurst emphasized.

▶ **Information Feedback**—Hughes has applied the same tight control, closed-loop philosophy to the assembly lines where major components are assembled and wired.

There is a test-inspection station at the end of each sub-assembly line. When a faulty unit shows up, the inspector-tester is never more than a few steps from the work station where the error was made. Rapid feedback of information directly to its source quickly clears up the trouble, Parkhurst says.

The assembly lines are built in a variety of lengths from a single standard modular-type work station developed by Hughes Aircraft. The work stations can be provided with either a flat-top working surface or a track to accommodate four-wheel dollies which carry the work from one station to the next. The dollies can be equipped with several sizes of turret heads to accommodate a wide variety of work sizes and shapes.

Radar antennas and receiver-transmitters are assembled in large frames suspended from an overhead track.

▶ **Geared to Rapid Change**—Hughes has geared its assembly lines to handle the frequent circuit changes and improvements which experience shows are inherent in the fast-moving fire control business.

The preponderance of these changes are what Parkhurst calls "floor-type changes"—minor circuit changes that can usually be introduced in the line less than eight hours after the need first arises.

▶ **Scheduling and Bookkeeping**—Approximately 15,000 parts go into an interceptor fire control system and this poses a serious flow and scheduling problem.

The Hughes solution is to set up an accumulation area immediately adjoining the assembly line. A two-to-three week supply of every part needed in a particular line is stored here in individual bins and the assembly line is replenished weekly from the accumulation area. This area in turn replenishes its own stock from general inventory as needed.

As a result of its close inventory control, HAC achieves a five-fold inventory "turnover" a year.

Keeping financial tab on 15,000 parts could be a backbreaking effort, but it isn't at Hughes. An analysis showed that about 85% of these parts represented only 10% of the total material costs. So Hughes treats any part costing

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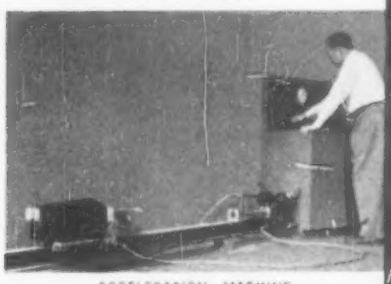
SONAR TANK

SHAKE TABLE



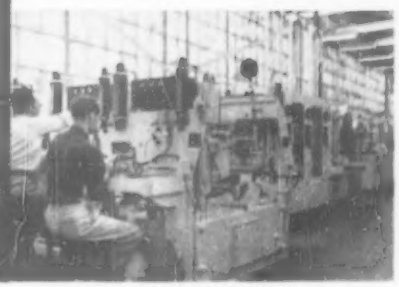
ACCELERATION MACHINE

MINIATURIZATION

ENVIRONMENTAL TESTS

CHEMICAL LABORATORY

ULTRASONIC LABORATORY



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two dollars or less as "line stock," much like most manufacturers treat nuts, bolts, and washers. The 15% of the parts that cost more than two dollars are handled on a controlled basis and requisitioned as needed.

▶ **Easing Production Headaches**—Putting a newly developed system into production normally produces lots of headaches in engineering and manufacturing departments. Manufacturing people usually ask for many changes in design to make the equipment easier to produce. These changes frequently hurt system performance, and the development engineers must be called in to redesign circuits to get performance back up to specifications.

Hughes eases this problem by means of a low-rate pilot production line operated in its research and development labs prior to full-scale production.

The pilot line gives production people an opportunity to solve the fabrication problems, suggest design changes, and get familiar with the new system. Lab engineers get a chance to make design changes without the disruptions that would occur if tried in full-scale production.

As pilot production tapers off, the manufacturing people on loan to the labs return to the manufacturing division with knowledge of the production job they are soon to tackle and some of the problems they'll face

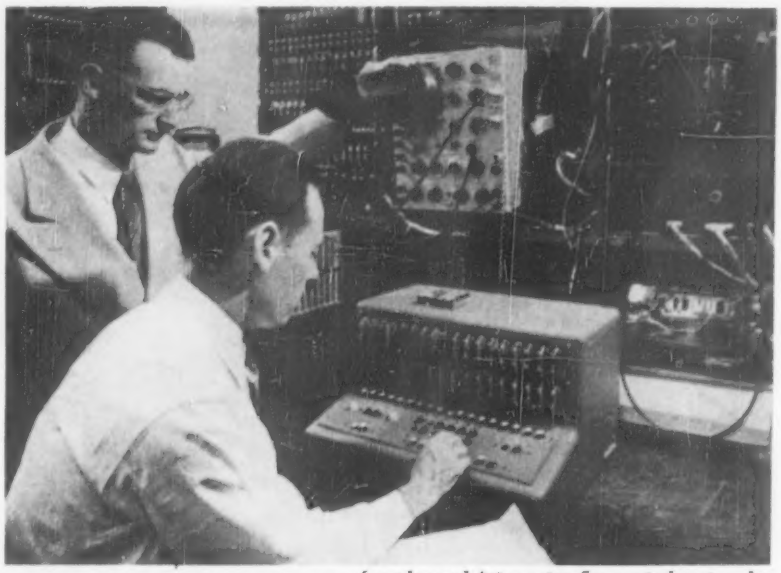
▶ **Speed-Up**—Even before the pilot run is complete and the final design is frozen, Hughes has begun to release drawings to its manufacturing division for procurement of parts and the building of special tooling and equipment.

This is a calculated risk and results in some scrappage. However HAC officials say that it reduces by many months the long gestation period otherwise required to develop and put new complex systems into production.

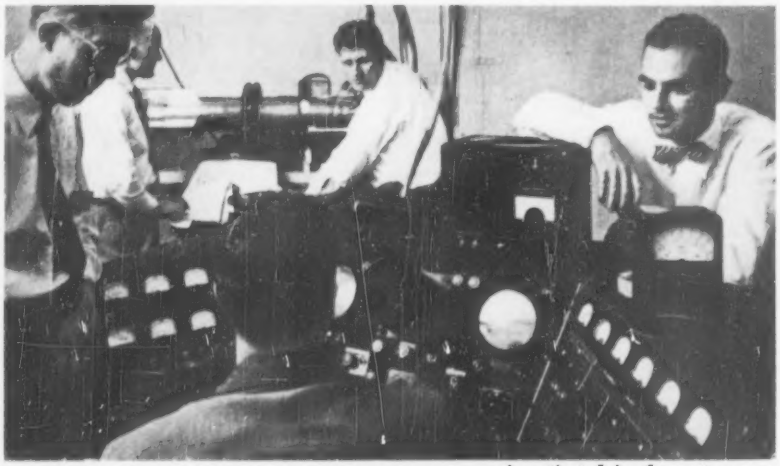
Hughes also speeds up flight testing of experimental equipment by operating more than 20 aircraft, many of them jets, from a runway adjoining the R & D labs. (On occasion, Hughes engineers have literally picked up laboratory benches and moved them and their breadboard circuitry into a C-47, saving precious installation time, Dr. R. P. Johnson told AVIATION WEEK. Johnson is associate director of the R & D labs. When equipment troubles develop, the airplane can be taxied into the lab yard and the technical experts from the lab are immediately available for trouble-shooting.

▶ **R & D Labs**—The fire control systems built by the Electronic Manufacturing division here, and the Falcon (air-to-air) missile to be (or being) built at the Tucson, Ariz., missile plant, were developed and designed in the 4,000-man Research and Development laboratories. Dr. Dean E. Wooldridge,

What Hughes Aircraft Research and



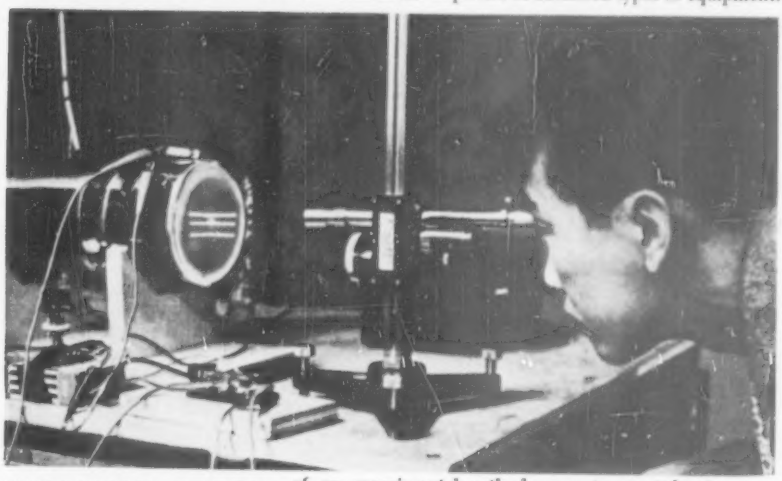
DIGITAL COMPUTER for advanced interceptor fire control system has information fed into its magnetic memory drum.



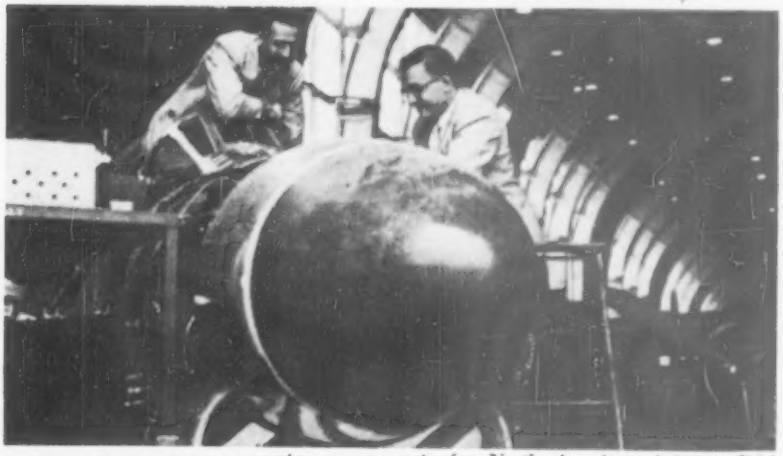
MISSILE CHARACTERISTICS are investigated in the systems engineering test laboratory.

EXPERIMENTAL SHOP shown is one of several assisting research and development engineers in their work.

SIMULATOR 'FLIES' fire control problem in laboratory to work out details in development of advanced types of equipment.



WRITING SPEED of an experimental cathode ray storage tube is measured by engineer in electron tube laboratory.



FIRE CONTROL system components for North American Aviation F-86 Sabre get engineering check in the laboratories.

formerly of Bell Telephone Labs, is vice president and director of the labs; Dr. Johnson is next in command.

The scope of this division's activities is broader than its name suggests. In addition to research and development, the R & D labs have responsibility for production design and system engineering. Until recently, field engineering was also an R & D labs responsibility but it has now been made a separate company division.

The labs operate on a semi-autonomous basis. They have their own personnel and purchasing departments as well as five large model shops to produce experimental and pilot-line models.

The two largest technical groups within the R & D labs might be called "weapons systems" groups. The guided missile lab is responsible for the complete development and design of the Falcon; the radar lab has similar responsibilities for interceptor fire control systems. Three other laboratories—the Advanced Electronics, Electron Tube, and the newly formed Microwave—push out the frontiers of knowledge in their fields, develop new devices, and support the weapons systems groups.

▶ **Weapons Systems Labs**—The missile lab is sub-divided and organized on the basis of professional skills i.e. aerodynamics, propulsion, electronics, controls, etc., Dr. Johnson says.

In the fire control lab, where several different systems are under development at any one time, a project-type of organization is used Johnson says. Teams af men with aerodynamic mechanical, electronic, and other skills are assembled to work on specific fire control system projects.

▶ **Research Labs**—Hughes realizes that major improvements in missile and fire control performance frequently come from basic or fundamental research. This explains the existence of HAC's electron tube, advanced electronics, and microwave laboratories. But there are other reasons.

The advanced nature of HAC's work means that its needs are frequently years ahead of component development by outside component manufacturers. Then too, missile and fire control needs are sometimes so specialized, and the market so limited (by comparison to radio-TV), that manufacturers are unwilling to develop suitable devices or components.

• **Electron Tube lab** is currently investigating "resistive-wall amplifiers," a comparatively new technique for amplifying microwave energy through the interaction of electron streams with electric fields induced in surrounding resistive tube walls. The lab is also working to reduce shot noise and improve the efficiency of traveling wave tubes to permit their use as broadband oscillators and mixers in radar and missile

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guidance. This laboratory is putting considerable effort into storage-type cathode ray tubes to provide better radar presentations in interceptor fire control systems.

• **Advanced Electronic lab,** activities are broad in scope and include research in semi-conductors, automatic data processing, communication systems, magnetic components, and sub-miniaturization techniques.

One notable program is the development of an airborne digital computer which can be used for navigation, fire control, and other aerial "problems." The object is to devise a single universal computer which can replace several old-type analog computers each of which must be tailored to one specific task. (Advantages of airborne digital computers were described in AVIATION WEEK Dec. 29, 1952, p. 27.)

• **Microwave lab,** recently organized, performs basic investigations on microwave propagation characteristics and new microwave techniques for use in missile guidance and fire control systems.

▶ **Transferring Know-How**—To supplement normal channels for transmitting know-how from the research labs to the systems labs, Hughes occasionally transplants personnel from one lab to another, Dr. Johnson reports. He cited a group of miniaturization specialists from the advanced electronics lab who were assigned to missile and fire control labs in order to pass along their accumulated knowledge.

Dr. Johnson admits that it is sometimes difficult to get the systems labs to release these specialists to return to their home labs.

▶ **Work in Commercial Fields**—The R & D labs are currently studying the automatic data handling needs of industrial, financial, and commercial companies.

The object is to design a line of equipment suitable for their use, yet sufficiently versatile to find wide application.

Hughes officials think there is a bright industrial future for the servomechanisms and digital computer know-how gained in missile and fire control work.

The germanium diodes which HAC is currently marketing commercially were developed in the R & D labs. Work on junction transistors is currently in progress there.

▶ **Role of Field Engineering**—Hughes gives its field engineering department a broad and important role at company headquarters here in addition to the customary role in the field. Local activities include:

• **Feedback of information** on equipment performance in the field to appropriate factory groups.

• **Influencing design of test equipment**

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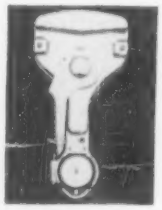

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for maintenance in the field.

• **Writing technical manuals** and instruction books.

• **Conducting technical schools** to train military personnel in the use and maintenance of HAC equipment.

• **Preparation of modification** instructions and field modification kits.

HAC field engineers also perform the usual technical liaison at airframe manufacturers plants where Hughes equipment is being installed and at airfields throughout the world where Hughes equipped interceptors are based.

▶ **Emphasis on Feedback**—E. M. Boykin who heads HAC's Field Service and Support division places great importance on the information feedback role of his group. A Hughes field engineer must have a degree in electrical engineering or physics, Boykin says, because men are needed who are more than technicians.

Hughes field engineers must have the technical savvy to pinpoint the causes of equipment failure and to recommend design changes for improved performance. In some cases, field engineers are transferred back to the R & D labs and assigned to preliminary design groups where their field experience can be used to shape the design of new equipments, Boykin says.

Hughes doesn't allow field reports on equipment failures to languish in the field engineering department. Copies are quickly made and distributed to the appropriate engineering, manufacturing, and quality control sections for action.

When a product or component from an outside vendor shows up too frequently on these failure reports, the vendor's name may be dropped from an approved vendors' list. This prevents other groups within HAC from unknowingly using a component that experience has shown to be unsatisfactory.

Within the past several months, Hughes has set up a system to log component failures on IBM cards to provide its design groups with easy access to statistical information on the reliability of individual components. If a development engineer has a choice of using either of two tube types in a particular circuit and wants to know which type has the better field service record, he can turn to the IBM cards for a quick and quantitative answer to his question.

▶ **Unusual Philosophy**—"The number one objective of our Field Test Equipment section is to make external field test equipment unnecessary," Boykin told AVIATION WEEK. Field engineers work with his section of the R & D lab during the design of fire control and missile equipment to suggest ways of incorporating self-checking or built-in test circuits while the design is still fluid. This philosophy and practice can greatly reduce the size and complexity of external test equipment, Boykin points out.

In the F-89D or F-94C, a maintenance man or the radar operator can give his Hughes fire control system a quick pre-flight or in-flight check using a built-in tester, Boykin says. By positioning a selector switch to each of 18 different positions, the operator can check a like number of critical system voltages. (A moving card, positioned by the selector switch, shows the voltage that should be obtained in each switch position.

In the F-86D, which has no separate radar operator, this built-in tester is mounted in the fuselage and is accessible only on the ground.

▶ **Interim Test Equipment**—Maj. Gen. Donald L. Putt, vice commander of the SAF Air Research and Development Command recently made a plea to the avionics industry to get its field testers out on time (AVIATION WEEK Apr. 27, p. 64).

The difficulty is this. If testers are designed early in the program, they are frequently obsoleted by last-minute changes in the equipment which they are designed to test. If the tester design is delayed until the equipment design is frozen, the testers will lag the equipment by a year or more.

The Hughes solution is to build preliminary field testers to hold the fort

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Controllable inductor, called the Type 65BA1 Increductor, can be used for wide-range frequency shift or inductance variation in frequency sweep oscillators or remote tuning controls. Unit provides a minimum of 7:1 frequency variation and has an upper frequency limit of 30 mc., according to its manufacturer. Maximum inductance of 30 μh at zero control current can be reduced to 1/50 the starting value with a 40-ma. control current. C. G. S. Laboratories, Inc., 391 Ludlow St., Stamford, Conn.

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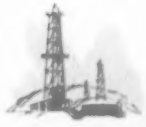
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TURBO COMPOUND POWERED

DOUGLAS DC-7

Selected by

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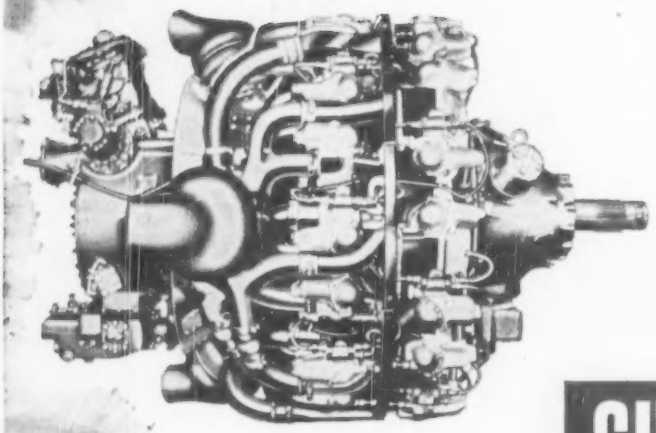

The new Douglas DC-7 is the fastest, most powerful, most luxurious of the world-famous line of Douglas commercial transports. Four Curtiss-Wright Turbo Compound engines provide the DC-7 with the extra speed, range, economy and payload that assure profitable operations in the competitive air transport field for many years to come.

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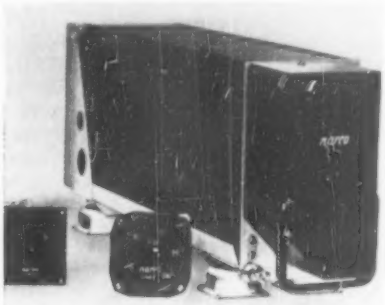
during the first few months that the equipment is out in the field. The final tester is started after the equipment design is frozen.

▶ **Coping With Complexity**—The Hughes fire control systems used in the F-89D, F-94C and F-86D are complex, even to an avionics observer. Each system consists of some 35 separate "black boxes" containing over 200 vacuum tubes and thousands of associated parts. The Air Force had learned to expect avionic complexity in its bombers but it must now learn to cope with comparable avionic complexity in its interceptors.

HAC's field engineering group has schooled some 300 Air Force and Navy fire control specialists in a series of 25-week courses. Some of men, from technical training commands, have returned to their outfits to set up schools for working-level technicians. Others have returned to operating air groups to set up suitable maintenance facilities.

Hughes doesn't underestimate the problem the military faces in keeping its new fire control equipment operating. A HAC study indicates that an average of 1½ military technicians per interceptor will be needed. If the military can provide this trained manpower in adequate quantity, HAC officials confidently predict that the equipment will be operational when needed. They cite, for example, the results of experimental flight tests on a current HAC system at Eglin AFB, Fla. Given adequate maintenance, this system racked up 18 missions without failure, a HAC official says.



New Narco DME

In the midst of growing interest in distance measuring equipment, National Aeronautical Corp. (Narco) of Ambler, Pa., has announced its own entry in the DME field. The Narco set, which weighs 30 lb., is designed for executive and corporation type aircraft as well as for airline use.

The new DME uses a pointer-type indicator with a 0-200-mile range cruise scale that can be switched to a 0-20-mile scale for approaches. Narco says recent flight tests have shown its DME

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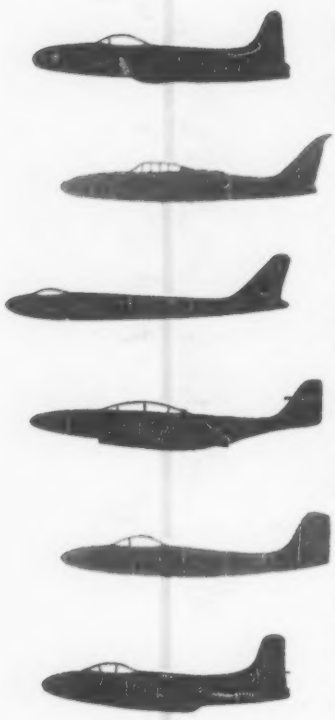
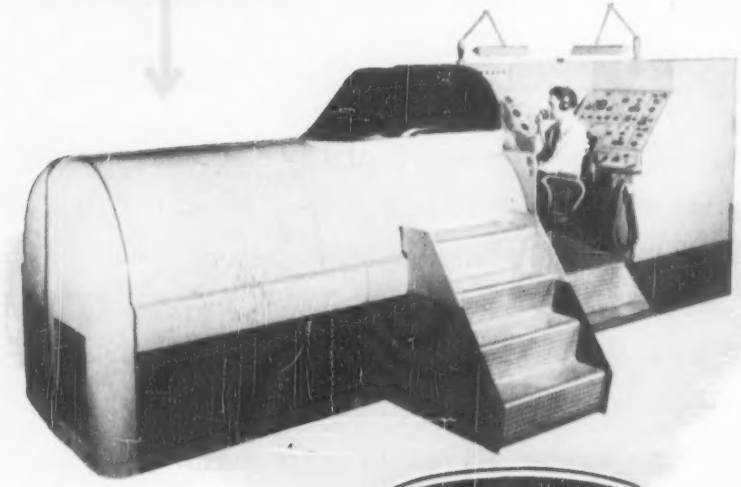


As aircraft behavior at sub-sonic and super-sonic speeds becomes more and more complex, the need for thorough on-the-ground flight training becomes ever more vital to the success of the Air Training Program. At the same time the simulation of these complex flight conditions demands infinite precision.

Link Electronic Equipment simulates *with infinite precision* every power and aerodynamic factor that influences take-off, flight and landing . . . speed, direction, rate of climb, effect of fuel consumption on trim, flight position, deviation and a host of others.

This infinite precision is built into all Link Electronic Equipment. Link Jet Trainers operate with the dependable certainty of the simplest mechanism. Yet they duplicate *exactly* the "in air" conditions of today's most advanced aircraft.



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LINK invites employment applications from engineers and draftsmen.

to have an error of less than 2% on the cruise scale and less than one-half mile error on the approach scale.

▶ **Design Highlights**—The Narco DME is mounted in a half-ATR case and requires no external a.c. supply. Transmitter frequency is crystal controlled and pulse timing is obtained from magnetostriction delay lines. Narco says its DME is the first with an approach scale as low as 20 miles. The new DME uses plug-in unit type of construction and is available with either standard or Arinc ruggedized.

A special flashing light may be used for positive identification of a transponder associated with a known VOR.

The Narco set was developed to specifications prepared by the Civil Aeronautics Administration under a project sponsored by the Air Navigation Development Board. Narco says its DME will be available later this year.

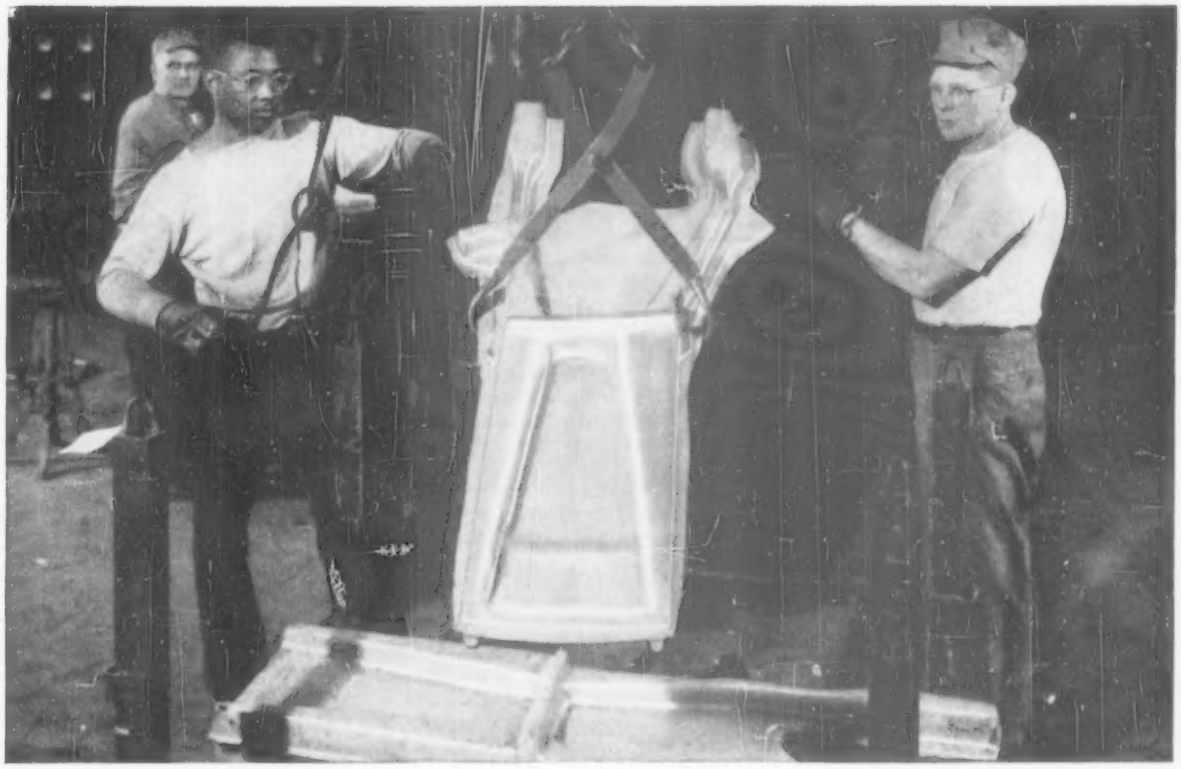
FILTER CENTER

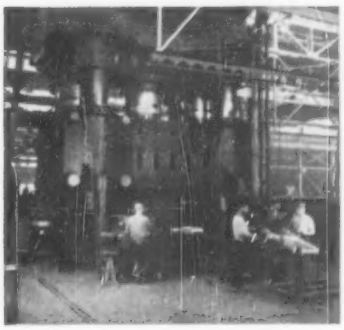
▶ **Autopilot Problems on F-86D**—The metering valve that North American Aviation introduced in the F-86D elevator power control system to make the airplane less responsive to slight stick movements has raised autopilot stability problems. The valve reportedly introduces lags which upset the previous airplane/L-5 autopilot compatibility.

▶ **Wescon Lists Program**—Seventeen technical sessions and approximately 85 technical papers have been scheduled for the Western Electronic Show and Convention to be held Aug. 19-21 in San Francisco. The program will include two sessions each on antennas, propagation, electron devices, circuits and computers. There will be one session each on airborne electronics, microwave techniques, servos, telemetering, instrumentation, transistors and nuclear-radiation measurements.

▶ **Making Jets a Better Target**—Lockheed finds that the jet fighters which serve as tracking targets for its radar-equipped F-94Cs are extremely difficult to spot on the F-94C radar scope, observers report. To lick the problem, Lockheed is experimenting with radar transponder beacons and corner reflectors hung from the tip tanks of its target planes to strengthen their radar echos.

▶ **UHF Troubles Persist**—The military, which is switching its airborne communications to the UHF region, is still plagued by propagation troubles when flush-mounted antennas are used. Observers report that propagation is excellent at times, only to be followed by severe and unexplained fading. —PK





GIANT ALUMINUM FORGINGS SPEED PRODUCTION OF McDONNELL DEMON

A team of engineers from Alcoa and McDonnell Aircraft Corporation developed the structural keystone for the F3H-1 Demon. Two 350-pound Alcoa forgings attach the wings to the fuselage, "carrying-through" the tremendous loads imposed by high-speed flight.

Earlier designs embodied a series of complex assemblies for this spar section. Fabrication was time-consuming and expensive . . . produced overweight spar sections. The Alcoa forgings save weight, time *and* cost!

One of the first aviation applications produced on this Alcoa-operated 15,000-ton press, McDonnell's 350-pound forgings point the way to similar savings for other aircraft manufacturers. Sheer size of the press permits far larger and more intricate forgings to be produced—with complete air frame subassemblies formed in a single unit.

For additional information on this press . . . or *any* of Alcoa's facilities, contact your nearest Alcoa sales office—listed under "Aluminum" in your telephone directory—or write: Aluminum Company of America, 1800-T Alcoa Building, Pittsburgh 19, Pennsylvania.

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SKIN PANEL ALLOWABLES INCREASED WITH 75ST

hi-shears

75ST HI-SHEAR rivets combat "head popping" and wrinkles in skin panels more effectively than 24ST DD rivets. Combining higher material strength and close tolerance heads, the 75ST HI-SHEARS permit higher shear and tension allowables, reduce shop problems and improve surface flushness.

HS25

rivets with the AN426 styled head permits countersinking in skin minimum thickness of .072 or more. Hole preparation is accomplished with same standard tools.

HS23

with the small HI-SHEAR styled head permits countersinking in thin gauges (.051 min.) and eliminates sub-countersinking or sub-dimpling in frame-to-skin attachments, extrusions, stainless steel, titanium or where dimpling clearances are lacking.

HS26

with a flat head attaches thin sheets where bearing is critical. Reduced by ⅓rds the weight of a steel fastener.

- 75 ST HI-SHEARS drive with ½ the force of DD rivets and eliminate "ice-boxing" DD rivets.
- 75ST HI-SHEARS use the same standard Sets as used in driving steel HI-SHEARS.
- 75ST rivet pin uses an A17ST HS24 collar (dyed blue).

WRITE for the HI-SHEAR Standards Manual.

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EQUIPMENT

Runway Light Nears CAA Ideal

A new type of variable-intensity airport runway light, developed by Line Material Co., is under service test at Milwaukee's General Mitchell Airport and is close to meeting the Civil Aeronautics Administration requirements laid down a year ago for the "perfect" runway light, CAA officials have announced.

The tests will continue several months under actual operating conditions at the airport, where a complete system of the lights has been installed.

Pilots of seven airliners, holding at Milwaukee during a recent low-visibility period, praised the effectiveness of the new installation.

▶ **How It Works**—It works like this: As visibility becomes less, the traffic controller turns up the intensity of the light. As intensity increases, the angle of the main beams in the unit are changed so that the brighter light is pointed down the runway, more directly toward the approaching plane. This change in "toe-in" is accomplished automatically without the use of motors.

CAA credits Cory Pearson and Mark Gilbert, CAA lighting engineers, and Leslie Vipond and Bernard Hemelt of CAA Office of Airports, with developing the requirements by plotting paths of typical transport planes in good and bad weather approaches. These requirements were published last year in CAA Technical Development Report No. 178.

At that time, Line Material Co., Milwaukee, had its new light in development independently.

Measurements of the light given by the units at 50% brightness for circling approaches indicate that the units are within 10% of meeting the theoretically perfect conditions. Only 1.5% of the deficiency is in a critical angle. It is expected that with only slight modifications it will meet the ideal requirements.

▶ **Advantages**—As for ground operation of the lights, L-M cites these advantages:

- **Brightness and coning** control are combined in a single operation.
- **Simple design,** resulting in low installation and maintenance costs and high reliability. Elements have been reduced and an electrical system simplified.
- **Lower mounting height** than most other types. Lamp is not seated on top of the mounting post but suspends from its side. Spherical shape minimizes breakage.

LINE MATERIAL'S new runway light.

- **Color filters** are not required.
- **Higher candlepower** than most types in use.

▶ **Thermostat Principle**—The new beam control system is based on the principle of unequal expansion and contraction rate of dissimilar metals. A helical bimetallic coil utilizes heat generated by the lamp to actuate the carriage controlling coning of the lights. This simple mechanism has a minimum of parts and practically eliminates maintenance, L-M says.

The light is a 120-v., 500-w., multiple-lamp type, requiring installation of an underground multiple distribution system, including cable and transformers.

▶ **Double Power**—CAA says the new Line Material lights show in tests that they meet approximately the 200,000-candlepower peak intensity that the company has specified. The CAA ideal specification calls for only 100,000 candlepower in the main beam. The light is designed for maximum utilization of excess lumens for circling guidance.

Mitchell Field was chosen for the installation because it already had an underground installation for multiple light in place at the runway. The lights are spaced 100 ft. apart for the first 1,000 ft. of the runway to emphasize the touchdown area, 200 ft. apart the rest of the way. The installation requires 140 lights.

"Milwaukee has got what may prove to be the best lighted airport runway in the world to date," says TDEC's Gilbert.

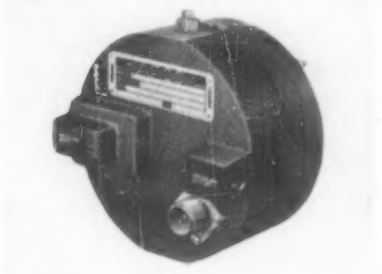
NEW AVIATION PRODUCTS

Cockpit Sun Visor

Fleetwide installation of cockpit sun visors has been made by United Air Lines.

The visors, on both sides of the cockpit, slide along monorails to the position desired, or they can be stowed in special brackets. They are made of du Pont acrylic resin H-2503, an ultraviolet-absorbing material, and are designed to cut early morning and late afternoon sun glare.

Complete kit, with left and right visors and all hardware, is supplied by Hardman Tool and Engineering Co., 1845 So. Bundy Drive, Los Angeles 25.



Pressure Regulator

A regulator for airborne radar which maintains pressure at a constant level regardless of altitude has been announced by Accessory Products Co.

The regulator employs a system of valves, one a relief, which are controlled by three aneroid bellows. It can compensate for leakage in excess of 200 cu. in./min. in pressurized radar systems. It is suitable for inlet pressures ranging from 20 to 1,500 psi. and for temperatures from −65 to 165F.

At low temperatures, valves in the regulator are heated by a thermostatically controlled element which operates off the plane's 28-v. d.c. electrical system. The unit can be supplied without heating elements where dry air is used for pressurization. The regulator operates on air or gas. It weighs two pounds and measures 5.75 in. in diameter and 3.75 in. in depth.

Accessory Products Co., 617 Putnam Drive, Whittier, Calif.

Radio Receiver Maker Sets Up Sales Pattern

Sales of low-cost Monitoradio aviation receivers, produced by Radio Apparatus Corp., Indianapolis, will be handled in the future under exclusive distributorship arrangements with aircraft parts wholesalers, the firm says.

The line includes the AR-2 and AR-3 receivers, designed to operate within the frequency range between 108 and 149 mc. Sets are priced at $66.50.

Eight major parts distributors have signed up, the company reports. They are: Air Associates, Inc., Chicago and Dallas area; General Aviation Supply Co., St. Louis and Houston; Don Horn, Co., Memphis; Van Dusen Aircraft & Supplies, Inc., Minneapolis, Teterboro and Boston; Art Whitaker, Portland and Vancouver; Air Parts, Inc., Burbank; General Aircraft Corp., Detroit; and Aviation Supply Corp., Tampa.

Canopy Desiccant

Sova bead, an improved desiccant developed by Socony-Vacuum Oil Co., is being used to prevent clouding of fighter aircraft cockpit canopies.

The product, contained in a cartridge unit, dehydrates air between the double canopy of a fighter. The cartridge assembly was developed by Aridair Products, Inc. Body of the unit is a clear plastic cylinder. Aluminum caps at both ends are threaded for tubing connections. The Sova bead desiccant is retained by screens, which are held securely but can be removed quickly without tools.

A Socony spokesman says the desiccant also has been used to keep moisture out of gasoline, among other applications. An advantage claimed is that it does not become "mushy" or sticky with constant use and can be reactivated indefinitely.

Aridair Products, 260 S. 20 St., Newark 3, N. J.

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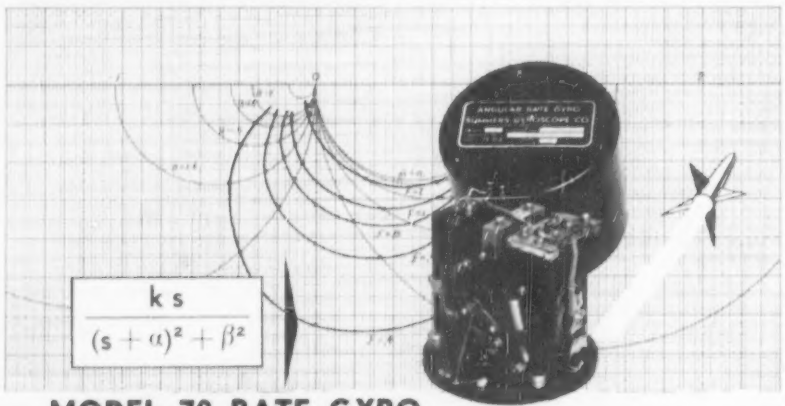

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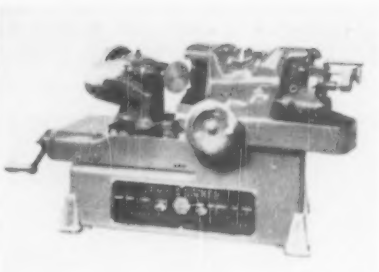


Valve Reconditioner

Black & Decker has developed a compact little machine designed to speed valve reconditioning in airline engine overhaul activities.

In addition to speed, emphasis has been placed on greater flexibility, improved cooling methods and higher efficiency in valve refacing operations.

The machine features an end grinding attachment which permits quick, accurate and efficient grinding of valve stems, tappets and rocker arms. A clamp locks the stem or tappet in place in seconds, the maker states. The machine grinds valve heads up to 4 inches, valve stems to ⅛ in., and valve angles from 0 to 90 deg. It transverse-grinds at all angles.

The cooling system provides wet grinding at both wheels on the unit, one-valve control and an improved coolant reservoir. Smooth-grinding hypoid gears, highspeed feed screws and simplified controls are among other advantages claimed for the unit.

ALSO ON THE MARKET

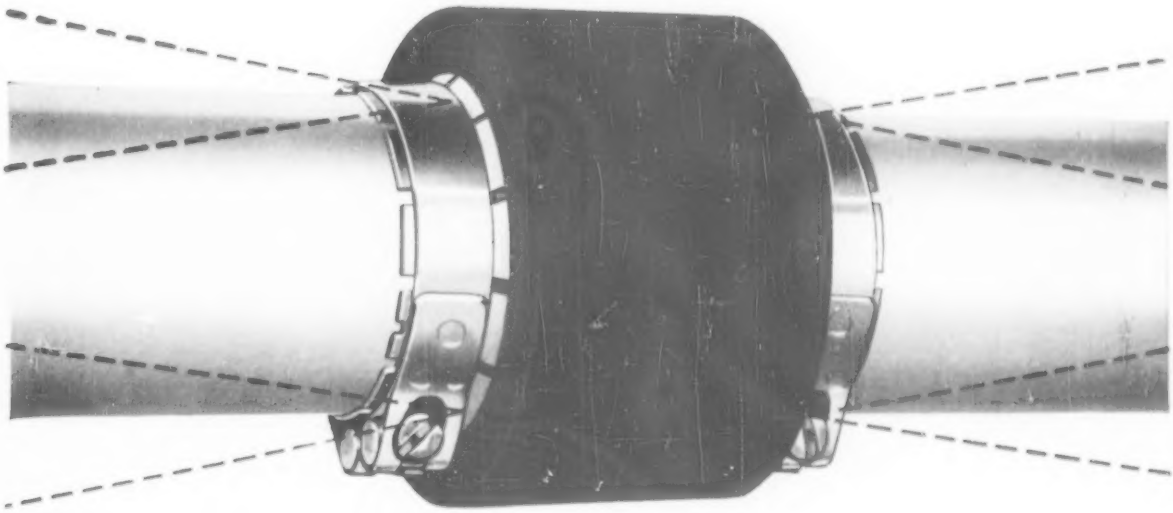
Solvent degreaser for production lines where speed is essential is practically non-toxic and non-inflammable, doesn't require special safety clothing and ventilating equipment. Manufacturer recommends product for cleaning of motors, as it has no adverse effects on insulation.—Brulin & Co., Inc., Dept 248, 2939 Columbia Ave., Indianapolis 7.

Press brake of 400-ton capacity that forms steel up to ¾-in. thick and 8-ft. wide, is said to be excellent for working to close tolerances and on coining operations.—Struthers Wells Corp., Machinery Division, Titusville, Pa.

High-heat-resistant adhesive with outstanding strength and durability characteristics has been developed in conformance with MIL A5433, A5434, A397A and AXS 1665. It cures without heat and will not decay cellulose fibers as do cements which are acid on final cure; is resistant to salt water, acids, solvents and oils.—Chemicals Development Corp., Danvers, Mass.

The Aeroquip Flex Joint

FIRST TO PERMIT SUCCESSFUL FLEXING OF RIGID FUEL LINES



Another "first" for Aeroquip! The amazing Flex Joint permits flexing of rigid fuel lines in aircraft while maintaining a positive, fluid-tight seal. Of simple, bellows-type design, the Flex Joint allows tubing to "give" 10°, plus or minus, and accommodates wing deflections, vibration, thermo-expansion, and construction tolerances. It is compact, light in weight and can be installed in confined areas without special tools . . . without precise cutting of tubing or flaring of tube ends. Extensive tests on the Flex Joint have been conducted ranging from −65° F. to +160° F., from flexing, vibrating and actuating, to testing under pressure and vacuum, and determining ultimate strength by bursting. The work has been conducted along lines laid down by the N.A.S.C. Descriptive literature is available; please write.

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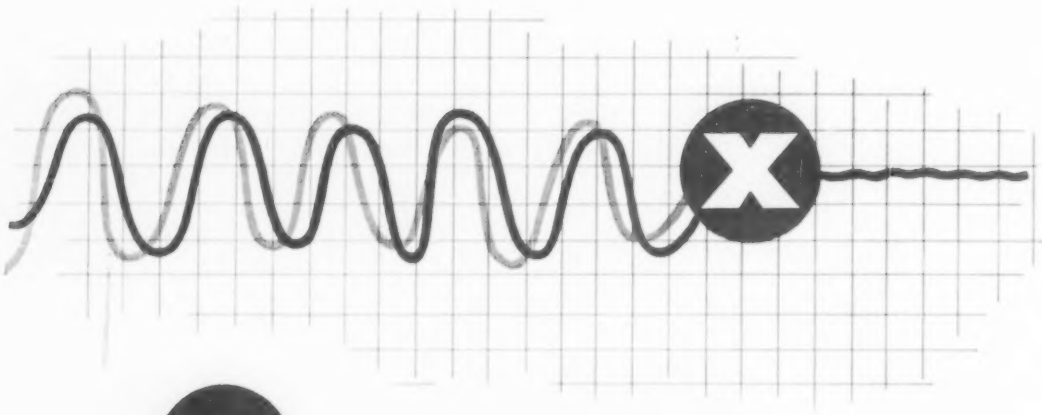

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CAB Starts International Subsidy Cuts

- **PAA Latin America Division takes $10-million slash; Board marks four other air operations for scrutiny.**
- **Economic staff investigates airline expenditures and investments for high sales expenses, over-capacity.**

By Lee Moore

Pan American World Airways is first airline to feel the knife of a new Civil Aeronautics Board policy aimed at cutting the government's ever-mounting subsidy bill.

The Board's rate-making staff cut the Latin America Division back $10 million from a normal 7% profit to about 3½% for the period Apr. 5, 1948 through Dec. 31, 1951.

Braniff, Delta-C&S, TWA and Pan American's Atlantic Division are next on the list for closer scrutiny under CAB's get-tough policy. All have final international mail rate cases pending.

▶**Two Criteria**—The Board's economic staff, directed by Gordon Bain, is probing every expense and investment and will apply two major criteria of unreasonable expenditure:

- **Over-capacity.**
- **High selling expense.**

▶**Why CAB Cut LAD**—In the Pan American Latin America case, the Board lopped $3,356,000 from PanAm's subsidy need because the company bought more planes and flew more schedules than the Board figured were reasonably justified. As an example, the Board cites flying of several planes a day on a route where one could do the job. CAB also notes average Convair utilization of only four hours a day.

On high selling expenses, the Board looked at the international operations and decided LAD sales and promotion cost were out of line. CAB says it will disqualify almost any airline's selling expense that comes to more than 19% of commercial revenues. The Board hacked $1,084,000 from PanAm subsidy on that yardstick. In the Atlantic mail rate case with TWA and Pan American, Bain's staff proposes to allow sales expense up to 19.5% of commercial revenues.

▶**Future Rate**—Of the total $10 million CAB cut out of Pan American's break-even need for the four-year period, about $5 million is lost to Pan American forever. But the company can recapture the other $5 million through later amortization of planes and facilities.

BAIN: Pare ever-mounting subsidy bill.

The CAB rate-making staff plans to settle a future rate for Pan American within about two months. It will be effective from about last Jan. 1 forward, leaving only the year 1952 still unsettled. The Board sets future rates to yield an estimated 10% profit return on recognized total investment and/or an 11% return on the common stock equity (AVIATION WEEK June 15, p. 79).

▶**Steady Increases**—CAB began its 100-page opinion by stating, "Throughout the review period, the break-even need of LAD increased steadily." The Board adds that as far back as 1950, it "directed the carrier's attention to the fact that remedial action by LAD was necessitated."

The Board says it later warned Pan American that "to the extent controllable management policies were responsible for the losses, the government would not underwrite these losses with mail pay."

The size of the final CAB cut surprised other airlines. International carriers are now studying the opinion in an effort to determine how the Board's policy may affect them.

▶**CAB Staff Decisions**—In most mail rate cases, including this month's LAD decision, the CAB economic staff settles directly with the airline. The Board generally appoves the staff settlement, did so in the LAD case.

Working directly on mail rate cases in Bain's Bureau of Air Operations are Irving Roth, chief of the Overall Rates Division and Harry Schneider, chief of the Mail Rates Section. Bain and the Board determine overall policy, but rely heavily on Roth and Schneider.

In the Atlantic mail rate case, the carriers would not come to terms with the staff and therefore requested full hearings. In such cases, the Board listens to the staff and the carriers, then decides for itself. However, the detailed presentations by the staff are the Board's main source for final decision.

Staff officials say that under Bain they do not bargain on the airline's subsidy claim but derive what in their opinion is the proper rate, based on statistical analysis of the carrier record. That is the reason the Board generally adopts something close to the staff recommendation.

NWA Re-organizes Its Management

Re-organization of Northwest Airlines management to step up efficiency and productivity of the carrier's domestic trunkline and international services is underway. Effective Aug. 1, the airline is establishing a Continental Division with headquarters in St. Paul to handle its domestic business and an Orient Division based in Tokyo to take care of its foreign operations.

Overall supervision and coordination of these divisions is to be handled by a system executive office some of whose members will move from St. Paul to New York (AVIATION WEEK June 15, p. 92). Among the NWA executives who will be located in New York will be Harold R. Harris, president; James W. Mariner, vice president-sales; Willis Player, vice president-public relations; E. I. Wyatt, vice president-comptroller; Linus C. Glotzbach, vice president-personnel; C. L. Stewart, vice president-plans; and Dale Merrick, assistant vice president-properties.

The Continental Division will be headed by Malcolm S. MacKay, vice president and the Orient Division assignment is being undertaken by L. B. Kinports as manager until appointment

of a vice president to the post is made.

Engineering consultants are studying the proper design and location of NWA's maintenance and overhaul facilities, now located at Holoman Field, St. Paul. Their recommendations will be submitted by Oct. 31. Possibility of moving to Seattle or Minneapolis-St. Paul Airport was reported in AVIATION WEEK (June 15, p. 92).

Loftleidir Cuts Fares, Wins Heavy Loads

Lower-than-standard fares, free food, bigger baggage allowance, free transportation to and from airports plus scheduled overnight accommodations at airline expense are winning high load factors for Loftleidir, the Icelandic Airline, on its once-weekly roundtrip DC-4 tourist flights between New York and Hamburg, Germany.

A report from the U. S. consulate at Hamburg, released by the Transportation, Communications and Utilities Division of the Department of Commerce, indicates the Icelanders are winning considerable trade from competing air carriers whose rates are regulated by International Air Transport Assn., of which Loftleidir is not a member.

▶**SAS Protest**—Scandinavian Airlines System, most seriously affected by the competition, already has threatened to leave IATA (AVIATION WEEK Apr. 20, p. 82) if the U. S. cannot force an adjustment in Loftleidir's rates. However, the U. S.-Iceland air transport agreement signed in 1945 makes no provision for price fixing.

Because it is not an IATA member, Loftleidir can charge whatever fare it desires on the New York-Reykjavik leg. Rate on the Iceland-Europe route is fixed at IATA levels by an agreement the country maintains with several European governments.

▶**Cooperative Agreements**—At present, the carrier's in-season New York-Hamburg roundtrip fare is $53 cheaper than competing tourist fares. Off-season rate saves the passenger $29.

The Icelandic airline operates under a cooperative agreement with Braathen South American and Far Eastern Air Transport, an independent Norwegian carrier that flies its DC-4 fleet as far east as Hong Kong. Under this agreement, Loftleidir operates on alternating weeks with Braathen equipment; in Germany, Braathen serves as the Icelandic line's ticket agent.

▶**Cut-Rate Competition**—Loftleidir's weekly flight leaves Hamburg and Copenhagen Saturday evening, makes an overnight stop at Stavanger and continues to Reykjavik the next morning. Twelve hours after leaving Reykjavik, it lands in New York. Monday evening the eastbound flight leaves New York, stops at Reykjavik and arrives back in Hamburg Wednesday morning, continuing on to Stavanger and Copenhagen.

SAS has seven tourist flights to New York weekly. All go through Hamburg. Pan American World Airways operates one Hamburg-New York tourist flight and seven between Frankfurt and New York each week.

To compete with the bigger airlines, Loftleidir offers in addition to reduced rates, a baggage allowance of 66 lb. as opposed to 44 lb. allowed tourist passengers by major carriers. Transportation to and from the Hamburg Airport is free to Loftleidir passengers and accommodations at overnight stops along the trans-Atlantic route are paid for by the airline.

ROVING TICKET OFFICE

Mobile ticket offices that go looking for customers have been put on the streets of Los Angeles and San Francisco by Trans World Airlines. Passenger tickets to any point served by the airline can be sold from these roving sales counters, built by General Motors. With loudspeakers to announce their arrival, they will be able to go wherever the crowds are, or follow established routes through outlying districts on a regular schedule. Aside from sales boosting, TWA hopes the plan will help avoid last-minute confusion at departure time by fully processing passengers when they make their reservations. Six people can be seated in anteroom inside the vehicle. It is not intended for delivery of tickets on reservations previously made by telephone. The scheme was conceived by Tom Hauret, TWA sales representative in Los Angeles.

Brazilian Airline Wins U.S. Route Rights

Brazilian International Airlines has won certification to fly to the U.S. and is negotiating to buy three Douglas DC-6Bs.

The new transports are scheduled for delivery by April 1955. The company plans to start U.S. service earlier, flying DC-4s to New York and possibly to Chicago via New Orleans.

Cruzicro, another Brazilian air carrier, has dropped its franchise to the U. S. because of failure to get subsidy.

Varig may be a later contender for Brazil-U. S. routes. But the airline says its recent order for three Lockheed Super Constellations was not aimed at North American service. The Super Connies probably will go into coastal South American service, competing with Panair do Brasil, a Pan American World Airways affiliate.

Rail Losses Spur P.O.'s Airmail Drive

Higher mail rates for railroads may be another spur to Post Office Department's drive for the right to ship some surface mail by airfreight.

This was the outlook at conclusion of an Air-Rail-Bus-Water Transport Panel study sponsored by Commerce Department. Robert Murray, Undersecretary of Commerce for Transportation, set up the panel within his Industry-Government Transportation Council to find solutions to the railroads' mounting deficit on passenger train operation. Air Transport Assn. participated in the study.

▶**Airmail Stimulus**—Interstate Commerce Commission reports total railroad passenger-train loss last year at $648 million. ICC estimates perhaps $64 million of this is assignable to some

phase of railroad mail service. Higher mail rates may be one answer and discontinuance of some rail-mail service another.

Both may further stimulate the Post Office desire to get more mail into the air.

▶ **Passenger Loss**—The panel is expected to recommend dropping many small-town passenger trains and stops as the major solution to losses. Many state regulatory commissions have forced railroads to continue services that long ago ceased to pay off, the panel finds. Legislation is proposed to permit ICC to overrule state bodies on the question of discontinuing uneconomic rail services.

Railroads' coach and first-class passenger miles each month are running from 1 to 12% under a year ago. Decline has been steady the past 12 months.

Braniff Pins Route Acceptance to Subsidy

Braniff International Airways and North Central Airlines revealed in oral argument before Civil Aeronautics Board that neither may want the new small-town route system in the Dakotas and Minnesota proposed by CAB.

The Board started the case by suggesting that Braniff serve the route, including several towns in CAB member Chan Gurney's home state of North Dakota. Proposed main route would serve numerous intermediate towns from Fargo to Sioux Falls and from there to Twin Cities.

BNF says it does not want the proposed local service routes unless it gets a subsidy. That position attempts to make acceptance of the proposed service contingent upon Braniff getting a subsidy in its domestic mail rate case.

North Central asked CAB for the proposed routes at the Fargo oral argument but admitted it is the least advantageous of several pending route-change applications that might strengthen NCA's already-sprawling local service system. North Central plans to acquire Lake Central Airline and/or Braniff's local Route 106.

Braniff wants to get rid of Route 106 and does not want any more local routes added, unless the Board will subsidize them. Right now, the airline still is on a compensatory mail rate of 53 cents a ton-mile but is carrying routes that were subsidized before Braniff acquired them through merger with Mid-Continent last year.

Certificate on MCA's Route 106 expires in September.

Both North Central and Ozark Airlines will ask CAB to transfer Route 106 to their system. A Braniff spokesman says his airline will not seek renewal of its own certificate on that route unless the Board grants subsidy to operate it.

CAB Names Griffith As Enforcement Chief

Civil Aeronautics Board has named Robert L. Griffith, former Delta and American Airlines executive and attorney, as new chief of the CAB Office of Enforcement. He succeeds Oliver Carter, who resigned.

A major portion of current work of the Office of Enforcement has been devoted to prosecuting nonscheduled airlines for exceeding the Board's present limits on route-type passenger revenue volume flown by independent carriers.

The enforcement chief has some discretion as to how soon and how hard to crack down on alleged violators. Washington observers expect nonskeds to protest appointment of a scheduled airline man, rather than a lawyer from another industry to this job.

Griffith comes to CAB from the Office of Price Stabilization, where he has been an attorney-adviser since 1951. Prior to that, he was assistant to the president of Delta Air Lines (1948-50) and secretary and assistant contract cargo manager of American (1946-48).

Correction

Civil Aeronautics Board examiner, in recommending approval of the Eastern-Colonial Airlines merger agreement, also suggested a National-Northeast Airlines merger—not National-Northwest as reported in AVIATION WEEK (June 22, p. 94).

New York-Balboa Case Heads for Rehearing

The two-year-old fight over what airlines may contract for one-plane New York-South America through service via equipment interchange will not get the fast Civil Aeronautics Board settlement requested by the President.

The White House asked the Board to expedite taking new evidence, but Pan American World Airways and Eastern Air Lines refused to waive full procedural rights at prehearing conference (AVIATION WEEK June 8, p. 18).

Their action may force a complete rehearing of the case.

Washington observers see final decision in 1954 at the earliest.

The controversial case got into trouble more than a year ago when CAB rejected an EAL-PAA interchange contract on grounds it would pit the strongest carriers against a weaker combination of National Airlines and Braniff International Airways.

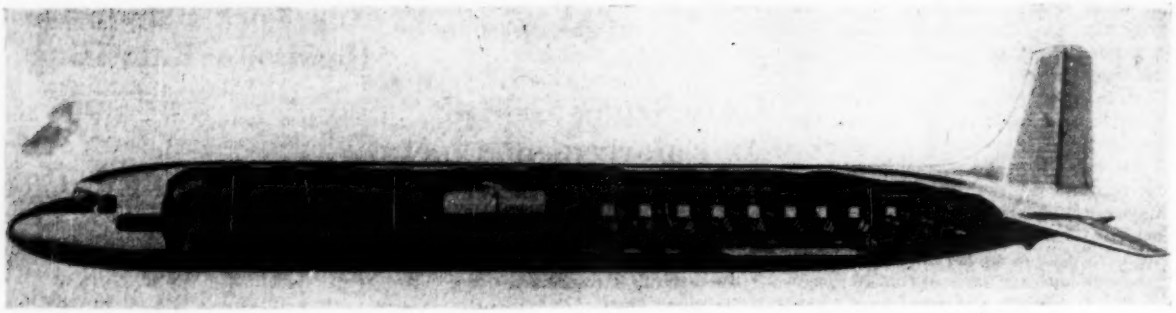
President Truman eventually rejected the Board decision. CAB reconsidered and sent the same opinion back. Truman pigeon-holed it, returned it to the Board when he left the White House. CAB then sent it to President Eisenhower.

Mr. Eisenhower sent the decision back to the Board again, asking speedy up-dating of evidence grown cold since the hearings, which were held two years ago.

Eastern and Pan American contend that since the original evidence was taken, National and Braniff have grown and now are able to stand up to the EAL-PAA combination.

100-SEAT DC-4

Six-abreast seating permitted carrying 100 passengers in a DC-4 flight contract labor haul between Puerto Rico and New York by Flying Tiger Line recently. This high-density arrangement, devised by Burns Aero Seat Co., is designed for passengers who are "smaller than average size." The installation is safe and comfortable, Flying Tiger and Burns state. CAA okayed it after evacuation tests showed passengers could clear the plane "in considerably less than the 100 seconds permitted." Weight of seats/passenger place is only 17 lb. Armrests, ashtrays, Airfoam cushioning and a 35-deg. recline feature are included. Burns Aero Seat Co., Inc., Burbank, Calif.



DOUGLAS DC-6C is seen fitted out for dual passenger-cargo role. Movable bulkhead can be located at any of four stations.

Douglas DC-6C

- **Convertible cargo-coach version offered airlines.**
- **Movable bulkhead allows varying dual-type loads.**

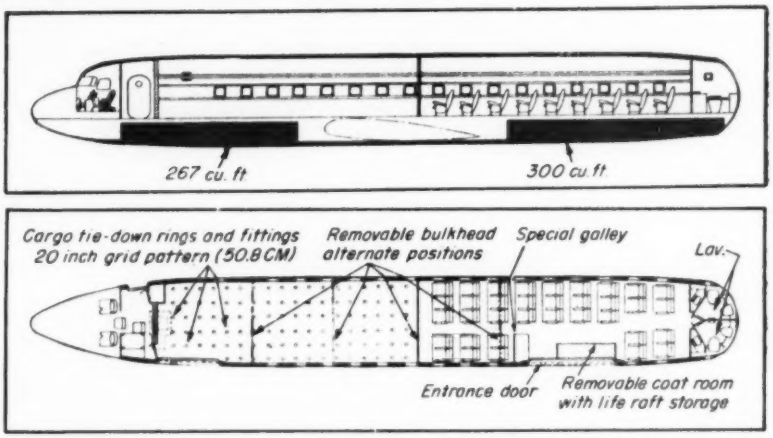
Douglas Aircraft Co., Santa Monica, revealed a new convertible cargo-coach plane in its DC-6 series, the DC-6C, designed for flexibility of interior configuration to handle special mixed cargo-passenger route problems. No firm orders have been disclosed.

Designed around the basic airframe and powerplants of the DC-6A Liftmaster freighter, the new convertible can be changed within a short period from a coach configuration carrying 76 passengers and baggage plus 2,400 lb. cargo to an interior carrying nearly 13 tons of cargo.

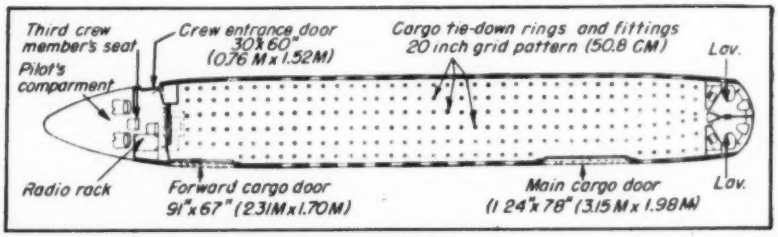
▶ **Features**—Facilitating the conversion are such special design features as:

- **Lightweight seats** which fold up against the wall for the all-cargo version, protecting the window and sidewall against cargo damage.
- **Movable bulkhead** which can separate passengers from cargo at any one of four stations, allowing variation in cargo and passenger load factors.
- **Lightweight folding hatracks,** which fold into ceiling when plane is used for cargo.
- **Food buffet and coat room** which can be removed during conversion.
- **Cabin lining** of tough but neat-appearing laminated Fiberglas panels in both configurations.
- **Cabin floor** features include: carpeting sectioned to correspond with movable bulkhead division points; cargo tie-down rings form a 20-in. grid pattern over entire cabin floor; floor is moisture proof to aid in cleaning cabin.
- **Large cargo doors** fore and aft.

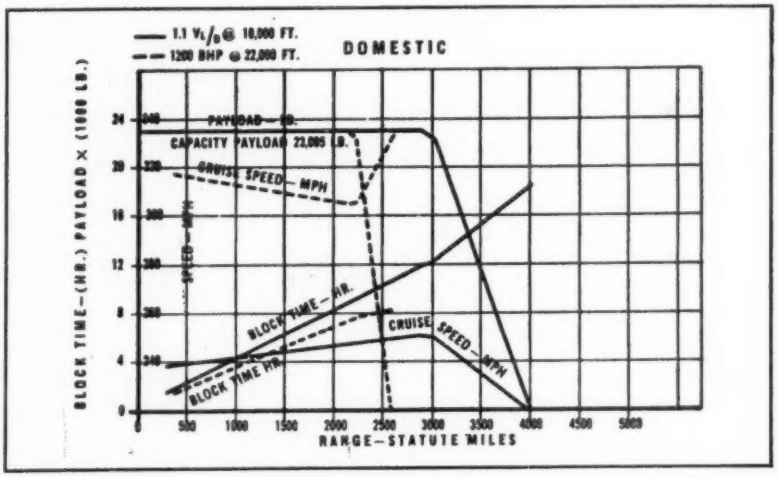
The DC-6C will have a cruising speed of 320 mph., and will take off at sea level from a 6,160-ft. runway at maximum takeoff weight of 107,000 lb., the manufacturer states.


267 cu. ft
300 cu. ft
Cargo tie-down rings and fittings 20 inch grid pattern (50.8 CM)
Removable bulkhead alternate positions
Special galley
Lav.
Entrance door
Removable coat room with life raft storage

DUAL-PURPOSE DC-6C interior configuration is detailed in above side and plan views.


Third crew member's seat
Crew entrance door 30"x60" (0.76 M x 1.52M)
Cargo tie-down rings and fittings 20 inch grid pattern (50.8 CM)
Lav.
Pilot's compartment
Radio rack
Forward cargo door 91"x67" (2.31M x 1.70M)
Main cargo door (1.24"x78" (3.15M x 1.98M)
Lav.

ALL-CARGO DC-6C ready to take 13-ton freight load. Seats fold against cabin walls.



PAYLOAD-RANGE PERFORMANCE plotted on this graph is for domestic version carrying 15 passengers and baggage plus 15,780 lb. cargo. Landing weight is 86,000 lb.

ICAO Fight

- **U. S. wants to limit goals, trim $2.8-million budget.**
- **Battle shapes up over nonsked foreign rights.**

(McGraw-Hill World News)

Brighton, England—The long arm of the Eisenhower Administration reached into this Channel-side resort this month, and the International Civil Aviation Organization got a warning to pull in its horns.

Addressing the seventh annual ICAO assembly, Robert Murray, U. S. Undersecretary of Commerce for Transportation, claimed: "ICAO's goals can be achieved with substantially less of a budget. We should ask ourselves, 'Is this or that project really a job for ICAO? Is it worthwhile?'"

Specifically, Murray told AVIATION WEEK: "We're here to see that ICAO is kept out of fields which are the rightful provinces of industry and operators."

▶**ICAO Soul Searching**—The Commerce Undersecretary came to the right place at the right time, for this session of the United Nations' specialized agency for civil aviation is concerned almost solely with the question: "Where do we go from here?" The soul-searching will go on for more than three weeks of committee meetings.

To get his point across, Murray brought a team of 14 experts and four observers—far and away the biggest of the 51 national delegations represented but "only half as big as usual."

Included were: Civil Aeronautics Board chairman Oswald Ryan; J. Paul Barringer, head of State Department's Transport & Communications Div.; and Harold A. Jones, former CAB member and very likely the next permanent U. S. member of the ICAO Council, replacing Rear Adm. P. A. Smith.

▶**U. S. Fight**—As the assembly broke up into technical, economic and administrative committees, it was obvious that the U. S. faces much opposition in its drive to curtail ICAO's activities.

Biggest battles are slated for the economic committee, which assigns work to ICAO's Air Transport Committee. It is here the U. S. delegates most want to head off projects strongly favored by other nations.

▶**Nonsked Target**—One target U. S. delegates have is an ICAO proposal to convene a conference this year to discuss measures that might be taken to safeguard commercial rights of nonscheduled operators in the international field.

This idea is backed strongly by the Dutch and Belgians; both KLM Royal Dutch Airlines and Sabena Belgian Airlines realize sizeable earnings from nonsked operations. They want nonsked air carriers to have more freedom to land and stop over in many countries. Most now require special permission for each nonsked flight.

The U. S., admitting considerable embarrassment in this matter, will oppose the idea on the grounds there is no agreement as to what actually is meant by "nonscheduled air transport operations."

▶**Big Goals**—A hardy perennial on ICAO agendas is the question of a multilateral agreement on commercial rights of scheduled operators. This still looks a long way off.

"Further progress in this matter," says an ICAO report, "will involve consideration of certain important related issues such as the avoidance of uneconomic competition, the achievement of fair opportunity for all, and the meaning of discrimination in the air transport field." These big goals are embodied in the ICAO charter. As a practical matter, they have defied detailed agreement so far.

Some U. S. delegates believe this is a good place to start economizing. Others think differently. Said Dr. Edward Warner, ICAO's perennial president: "There are special reasons for thinking of the possibility of finding new types of useful work in the economic field." He pointed out that the Council of Europe has asked ICAO to call a conference "to study the possibilities of coordinating European transport through an extension of ICAO-sponsored measures."

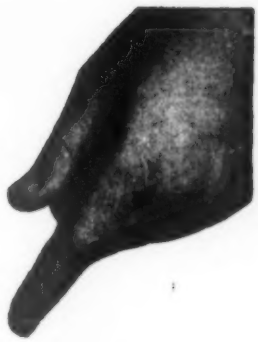
The ICAO secretariat also hopes the economic commission will sanction an investigation into fees charged for airport use and for navigational facilities.

▶**Innocent Resolution**—In addition to looking for places to economize, U. S. delegates on ICAO's technical committees are keeping a sharp eye on the British.

Great Britain was scheduled to propose an innocent-looking resolution designed to streamline ICAO's performance requirements. The U. S. is afraid the resolution somehow may prejudice the hot issue of jet aircraft requirements. It is so worded that it could mean almost anything.

The British Ministry of Civil Aviation has taken ICAO very seriously and obviously hopes someday to persuade the organization to adopt performance standards on their lines. But there are many moves in this chess match, and the current one doesn't look to be very momentous.

▶**Budget Battle**—ICAO's Administrative Committee is set to haggle at length over the budget. This year it is



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slated to require $2.8 million, virtually the same as last year. In addition, the organization earns more than $450,000 from various sources. Of this the U. S. puts up less than 25%. All in all, the budget is modest by international standards and it will be difficult for the U. S. delegates to push through any sizeable cuts.

In addition to its own budget, ICAO administers this year slightly more than $1 million in technical assistance granted by the United Nations Technical Assistance Agency. In the past, 28 countries have received civil aviation help of one form or another from ICAO.

By and large, the money is spent to finance:

- **Teams of experts** sent to instruct governments on all phases of civil aviation from meteorological observation to airline cost accounting.
- **Fellowships** to allow ICAO members to study in other countries.
- **Broad country surveys** of the needs for airports and facilities undertaken on behalf of Afghanistan and Thailand.

One thing the delegates seemed generally agreed on was desirability of Dr. Warner remaining as president of ICAO. While preferring to retire on grounds of poor health, he probably will be persuaded to stay on for a while, though probably not for another three-year term.

The assembly elected Sir Frederick Tymms, British representative, as president of the seventh session. Vice presidents elected: Jan W. F. Bakker, The Netherlands; H. R. D. Fontenell, Brazil; J. Paul Barringer, U. S. and Lakshmi Chandra Jain, India. —NMcK

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CAA Cool to ATA Re-organization Plan

Top Civil Aeronautics Administration sources last week forecast a mixed reception for the 10-point CAA re-organization program Air Transport Assn. has recommended to Undersecretary of Commerce Robert B. Murray, despite reports of its broad acceptance.

Hope is dim for completely eliminating the Office of Aviation Safety and merging its activities into a more efficient Aircraft Engineering and Maintenance Division. Neither does it appear likely that the maintenance organization will be returned soon to aircraft engineering, although most aviation industry people agree engineering should direct maintenance. Civil Service red tape appears to have entangled both these proposals.

Elimination of Hawaii as the Ninth Region and re-assignment of its activities to the combined Western Region of the U. S., Region 4, is not considered to be likely.

The recently announced regional reorganization is expected to stand.

Other proposals practically accepted and implemented: reductions in Washington personnel; expansion of the program for designated industry employes to supplement work done by CAA agents; a working arrangement under which CAA agents or designees would discuss violations with the pilot and carrier before reporting to Washington; consolidating international field offices, and curtailing statistical reports.

CAB ORDERS

(June 10-17)

Civil Aeronautics Board proposes to transfer eight trunkline city services to Ozark Airlines.

North American Airlines was turned down on its request that the Board delay enforcement action for flying more revenue flights than CAB's existing nonsked restrictions permit. North American argued that the purpose of the nonsked policy investigation is to write new regulations, urging delay of enforcement of the old regulation until a new one is decided.

Alaska Airlines was permitted to fly a single roundtrip on Pacific Northern Air-

lines' Seattle-King Salmon, Alaska, route because PNA did not accept the charter.

Southern Airways removal from some South Carolina towns is final. CAB denied petitions for reconsideration of certificate renewal order.

Seaboard & Western Airlines was permitted to fly refugees from Munich to New York June 29 because Pan American World Airways and Trans World Airlines submitted no bids for the charter.

Airlines' proposed increase in cargo valuation charges was withdrawn, making further CAB investigation on the subject unnecessary.

Air Transport Assoc. Inc., route applications were dismissed from trans-Pacific and West Coast-Hawaii route cases at own request. Board put the company out of common carriage business recently for operating more revenue flights than CAB economic restriction allows at the present time.

International Air Transport Assn. resolution was approved, allowing Avianca to make a free Colombia-Germany route inaugural flight.

Trans-Texas Airways authorized to drop night service to Helena, Ark., until adequate airport lighting is installed.

Skycoach Airlines Agency was ordered to stop advertising itself as an air carrier. Skycoach consented to a CAB cease-and-desist order to stop using words like "fly Skycoach" and the name "Skycoach Airlines" without "Agency, Inc." on the end.

Intercompany contracts between Ozark Air Lines and Scandinavian Airlines System, et al, approved.

North Central Airlines got CAB to delay the Fargo, N. D., service case for consideration with renewal of Braniff Airways unwanted local service Route 106.

Northwest Airlines director Leo G. Jacques interlocking relationship as president and director of Motor Products Corp. approved.

Routes of Alaska, Wien Alaska, Northern Consolidated and Pacific Northern Airlines modified in CAB decision of "Alaska Route Modification Case."

Pan American World Airways free ground shipment of cargo to airport at Seattle was discontinued some time ago, so CAB dropped an informal investigation by its enforcement.

Kansas City Shippers Assn. says it has no intention of doing airfreight business; CAB dismissed association from the freight forwarder policy investigation.

Robert Dollar Co. was given permission to buy control of South Pacific Airlines and lease two planes to the carrier. Dollar's common control of Globe Wireless, Ltd., and South Pacific was approved.

Transocean Air Lines was given permission to fly 76 members of Youth for Christ International, Inc., Oakland-Tokyo round-trip for $24,675 on Aug. 3. Pan American and Northwest declined the charter because of previous plane commitments. CAB denied PAA and Northwest protests that Transocean should be denied permission to make the flight.

Trans World Airlines was granted approval to fly a single load of passengers from Winslow, Ariz., July 1, because the flight was booked before CAB eliminated Winslow from TWA's route.

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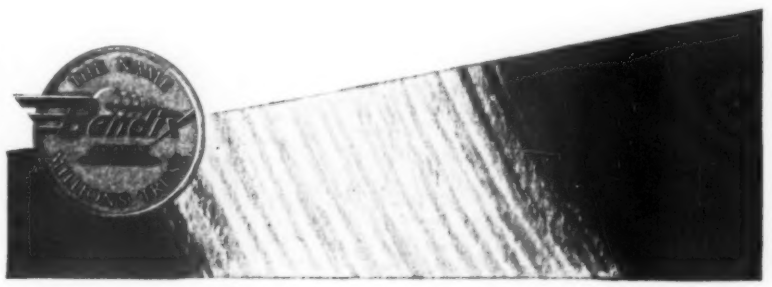

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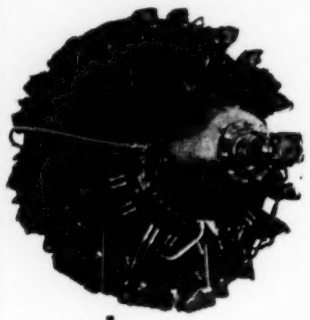

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350	G31502-A	Guardian	Relay
22	146102	Vickers	Brake Valve
9	557-5	Eclipse	Check Valve
107	D12296	Adel	Pump
67	19100-2-101B	Kenyon	Check Valve
88	3135-11C	Eclipse	Pressure Switch
32	3V-217-HC	Pesco	Separator
100	27314	Purolator	Oil Filter
128	3801-3B	Eclipse	Fuel Quan. Gauge
33	420313	Wright Aero	Pump Ass'y.
46	416421	Wright Aero	Drive Ass'y.
76	U635A (AN4000-2B)	U.A.P.	Fuel Strainer
12	U8416-MM	U.A.P.	Oil Cooler Ass'y.
25	26675	Airesearch	Motor
35	AA14002A	Vickers	Accumulator
21	FD65-5	Diehl	Motor
81	3616	Bendix Radio	Control
23	3620	Bendix Radio	Station Box
335	G1 (94-32376)	G.E.	Oxygen Pressure Signal Ass'y
180	AW-CV-1-1	U.S. Gauge	Check Valve
740	1C-200	G.E.	Radio Noise Filter
15	1EAR-2808H	Pesco	Pump
7	SP-1-445-8	Parker	Selector Valve
8	1E621	Pesco	Pump
29	NEP-2	Eclipse	Auxiliary Power Unit
16	LER-30D	Lawrence	Auxiliary Power Unit
4	2CM46A2	G.E.	Generator
6	[illegible]48EB	Pesco	Fuel Pump
21	2E2585A	Pesco	Pump
146	AW2-3/4-25K	U. S. Gauge	Manifold Press Gauge (Metric)
27363	CREB3N	Casco	Rod End
18	SA/3A	Kidd	Impact Switch
12	3G8D1A18A	G.E.	Regulator
18273	AN200-K3L2	Fafnir	Bearing
245	LMR-4	Micro	Switch
2094	PM-5	Spencer	Circuit Breaker
44	5BA25D-J4B	G.E.	Motor
31	5AM31JJ9A	G.E.	Amplidyne
111	5AM31NJ10	G.E.	Amplidyne
425	5BA40NJ1A	G.E.	Motor
189	5PD65-MB1	G.E.	Motor
25790	NR6L12	Torrington	Bearing
26	MS49A	Bendix Radio	Antenna Switch
45	D2060	C. P. Clare	Relay
298	727-TY37P	Weston	Air Temp. Ind.
2000	8909-K99	C. H.	Switch
2747	NAF310310-4B	Cannon	Plug
402	NAF310310-5B	Cannon	Plug
132	AN6209-8	Hydro Aire	Valve
50	AN6213-2	Bendix	Hyd. Valve
280	AN6220-4	Aeroquip	Couplings
27	AN6247-2	Adel	Hyd. Valve
14	UA8013-MM	United Aircraft Prod.	Oil Cooler
1175	RS-2	Mallory	Selector Box
172	A7012	Delco	Motor
6	8DJ13ABK	G.E.	Tachometer Indicator
200	2222-1F-2A	Eclipse	Tachometer Indicator
28	AN5770-2	Manning Maxwell Moore	Manifold Pressure Gauge
71	1003-4	Eclipse	Generator
427	NAF1016-1	Adams & Westlake	Light Ass'y.
616	NAF1016-2	Adams & Westlake	Light Ass'y.
1008	1222BF	Leach	Relay
751	B1392T	Teleflex	Gear Box
130	B1394T	Teleflex	Gear Box

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SHORTLINES

▶ **Avianca** now flies nonstop all-cargo service Miami to Barranquilla, Colombia, and thence to Bogota, three times a week.

▶ **British European Airways** claims $292,000 profit flying at 75% of capacity the first month of operation with the first five of 26 turboprop Vickers Viscounts on order. . . . Company says the Viscount's break-even load factor on BEA routes is 55%. . . . BEA Viscounts fly 1,000 mi. London-Rome with 47-seat capacity in scheduled time of 3 hr., 40 min.

▶ **Cubana** has purchased three Constellations for trans-Atlantic service.

▶ **Finnish National Airlines** has received its third and final Convair 340 for Helsinki-Stockholm service.

▶ **Honduras** is the 60th member of International Civil Aviation Organization.

▶ **Korean National Airlines** plans to buy a DC-4 to compete with Northwest Airlines on Korea-Japan routes. KNA now flies two DC-3s.

▶ **Logan International Airport** has approval of Massachusetts Airport Management Board for a modern 119-ft. control tower.

▶ **Northwest Airlines** president Harold R. Harris lambasted proposals by TWA and PAA to serve the Far East as an "act of cannibalism" that would devour NWA's routes. At a CAB hearing on the trans-Pacific renewal case, Harris called for "the sort of competition that safeguards the interest of the traveler, the shipper and the U.S. postal service."

▶ **Pacific Northern Airlines** says its May traffic of 943,280 ton-miles topped its previous record of August 1952 by 6%. Air cargo caused most of the gain.

▶ **Panagra** reports April cargo revenue of $112,000 was up 19% from 1952.

▶ **Piedmont Airlines** says its May volume of 5,063,837 passenger-miles set a new record for any local service line for any month.

▶ **Resort Airlines** next month starts its biggest route expansion to date, with extension of Miami-and-Caribbean vacation service to Chicago, Detroit, Cleveland and Pittsburgh. Previously, Resort flew from East Coast cities only. Summer schedules list 14 Caribbean stops available. . . . Company offers connecting service for Midwest passengers on its cruises via other carriers to Miami at the same package-tour fares.

▶ **Scandinavian Airlines System** has eight of its 14 DC-6Bs it ordered. . . . Company plans no more trans-Polar flights until it gets regular U.S. and Canadian permits.

▶ **Slick Airways** announces eastbound freight-rate cuts of 15-20% on fresh fruits and vegetables from California. . . . Company now flies four new Douglas DC-6As plus 20 C-46s.

▶ **Swissair** is discussing inauguration of service to South America.

Atlantic Cargo Permit

Airwork, Ltd., non-subsidized British airline, has applied to CAB for a foreign air carrier permit for scheduled trans-Atlantic cargo service to New York. CAB approval is assured under terms of the British-U.S. bilateral air agreement.

CAB, meanwhile, is in its seventh year of deliberation over whether to permit one or more U.S. carriers to give non-subsidized trans-Atlantic cargo service.

Airwork got British certification for scheduled trans-Atlantic cargo service last winter, but will not start operating this route on a regular basis until it acquires more planes, a British Embassy official says. Present equipment is the Vickers Viking.

Airwork is an independent carrier. It flies scheduled passenger and cargo service from England to the Middle East and East Africa, and does charter business elsewhere.

Airline Insurance

Civil Aeronautics Board says most airlines now have adequate insurance "to cover possible claims arising out of injury or damage to passengers and to persons on the ground."

CAB dropped a proposal to require certain airline insurance minimums because most airlines subsequently volunteered adequate insurance coverage, and the Board also found possible statutory limits on CAB power to require such insurance.

AVIATION CALENDAR

June 29-July 2—Semi-annual meeting, American Society of Mechanical Engineers, Hotel Statler, Los Angeles.

July 1-3—Annual meeting of University Aviation Assn., National College of Education, Evanston, Ill.

July 3-7—Seventh All-Women Transcontinental Air Race from Lawrence, Mass., to Long Beach, Calif.

July 4-5—Dedication of Coles County Airport, Mattoon, Ill.

July 7-16—20th national soaring contest, Harris Hill, Elmira, N. Y. Categories include: men's national, women's national, championship club and A, B and C.

July 9-12—Sixth International Aviation Exposition, Detroit-Wayne Major Airport.

July 15-16—IAS Annual Summer Meeting, Honors Dinner, IAS Building, Los Angeles, Calif.

July 18-19—Air review commemorating 50th anniversary of powered flight and 25th anniversary of Eastern Air Lines, Akron-Canton (Ohio) airport.

July 27-Aug. 2—1953 model airplane championships, U. S. Naval Air Station, Willow Grove, Pa.

Aug. 2—Amarillo, Tex., Jaycee Air Fair, observance of 50th anniversary of powered flight, Tradewind Airport.

Aug. 3-8—Fourth annual congress, International Astronomical Federation, Zurich.

Aug. 19-21—Western Electronic Show and Convention, San Francisco.

Aug. 19-24—Seventh International Model Plane Contest, sponsored by Plymouth Motor Corp., Selfridge AFB and Belle Isle, Detroit.

Aug. 25—Opening of the ninth legal committee meeting, International Civil Aviation Organization, Rio de Janeiro.

Sept. 5-7—National Aircraft Show and 50th anniversary of powered flight, Dayton (Ohio) Municipal Airport.

Sept. 7-13—1953 SBAC Coronation Year Flying Display, Farnborough, Hampshire.

Sept. 7-17—Fourth International Aeronautical Conference, joint meeting of RAeS and IAS, London.

Sept. 21-25—Eighth National Instrument Exhibit, Instrument Society of America, Sherman Hotel, Chicago.

Sept. 23-24—1953 meeting of Aircraft Spark Plug and Ignition Conference, Champion Spark Plug Co., Toledo.

Sept. 28-30—Ninth annual meeting, National Electronics Conference, Hotel Sherman, Chicago.

Sept. 29-Oct. 3—National Aeronautics Meeting, Aircraft Engineering Display and Aircraft Production Forum of the Society of Automotive Engineers, Hotel Statler, Los Angeles.

Sept. 30-Oct. 1—Aircraft electric equipment conference, American Institute of Electrical Engineers, Seattle.

Oct. 8-9—New England section meeting, Society of the Plastics Industry, Inc., Equinox House, Manchester, Vt.

Oct. 10—England-Christchurch (New Zealand) air race, with speed and transport handicap sections.

Oct. 28-30—Annual convention of Southeastern Airport Managers' Assn., Marlin Beach Hotel, Ft. Lauderdale, Fla.

ADVERTISERS IN THIS ISSUE

AVIATION WEEK—JUNE 29, 1953

AEROQUIP CORPORATION 61
Agency—Hoparaft Keller, Inc.

AIRBORNE ACCESSORIES CORP 8
Agency—Gray & Rogers Adv.

AIRCRAFT EQUIPMENT TESTING CO 68
Agency—Mahool Advertising, Inc.

ALLIED INDUSTRIES, INC. 31

ALLISON DIV., G. M. C. ..... Fourth Cover
Agency—Kudner Agency, Inc.

ALUMINUM CO. OF AMERICA 57
Agency—Fuller & Smith & Ross, Inc.

AMERICAN CHAIN & CABLE, PAGE STEEL & WIRE DIV. 42
Agency—Reinake, Meyer & Finn, Inc.

AMGEARS, INC. 34
Agency—C. Franklin Brown, Inc.

AUSTERNAL LABORATORIES, INC 46
Agency—Frank C. Nahser, Inc.

BEECH AIRCRAFT CORP 5
Agency—Erwin, Wasey & Co., Inc.

CARBON PRODUCTS CORP 77

CITIES SERVICE OIL CO 37
Agency—Ellington & Co., Inc.

CLARE & CO., C. P. 33
Agency—Reincke, Meyers & Finn, Inc.

CLEVELAND PNEUMATIC TOOL CO., THE 62
Agency—Meldrum & Fewsmith, Inc.

COLLINS RADIO CO. 27
Agency—W. D. Lyon Co., Inc.

CONSOLIDATED VULTEE AIRCRAFT CORP 59
Agency—Thomas Yates Adv., Agency

CONTINENTAL CAN CO. 50
Agency—Batten, Barton, Durstine & Osborn, Inc.

CURTISS WRIGHT CORP. 51
Agency—Burke Dowling Adams, Inc.

DARNELL CORP. LTD. 68
Agency—Henry L. Rhea Adv.

DAVIS AIRCRAFT PRODUCTS, INC 22

DeHAVILLAND AIRCRAFT OF CANADA LTD 39
Agency—Paul Taylor-Phelat, Ltd.

DOW CORNING CO. 24
Agency—Don Wagnitz Adv.

EDISON, INC., THOMAS A. 26
Agency—Gotham Adv. Co., Inc.

ELECTRICAL ENG. & MFG. CO 19
Agency—West-Marquis, Inc.

FLIGHT REFUELING, INC. 20
Agency—Davis-Parsons, Inc.

GENERAL ELECTRIC CO. 10
Agency—G. M. Basford Co.

GIANNINI & CO., INC., G. M. 42
Agency—Western Advertising Agency, Inc.

GOODRICH CO., B. F. 3
Agency—Batten, Barton, Durstine & Osborn, Inc.

HARVEY MACHINE CO. ..... Third Cover
Agency—Hixson & Jorgensen Adv., Inc.

HI SHEAR RIVET TOOL CO 56

HYDRO AIRE, INC. ..... Second Cover
Agency—Roy S. Durstine

JOHNSON RESEARCH CORP 77

LEWIS ENGINEERING CO 4

LINK AVIATION, INC. 56
Agency—Buchanan & Co., Inc.

MECHANEERS, INC. 77

MINNEAPOLIS-HONEYWELL REG. CO Front Cover
Agency—Foote, Cone & Belding

NORTH AMERICAN AVIATION CO 77
Agency—Batten, Barton, Durstine & Osborn, Inc.

NUTT-SHEL COMPANY 29
Agency—Welsh Hollander Adv.

OHIO SEAMLESS TUBE CO 38
Agency—Howard Swink Adv. Agency, Inc.

PACIFIC DIV. OF BENDIX AVIATION CORP 47
Agency—The Shaw Company

PACIFIC SCIENTIFIC CO. 52
Agency—Darwin H. Clark Co.

PASTUSHIN AVIATION CORP 8
Agency—Lynn Western, Inc.

ROHR AIRCRAFT CORP. 23
Agency—Barnes Chase Co.

RYERSON & SON, INC. 52
Agency—Aubrey, Finlay, Morley & Hodgson, Inc.

SCINTILLA MAGNETO DIV. BENDIX AVIATION CORP. 35
Agency—MacManus, John & Adams, Inc.

SEARCHLIGHT SECTION 69, 70, 71, 72, 73, 74, 75

SHELL OIL CO. 6
Agency—J. Walter Thompson Co.

SMITH MORRIS CO. 30

SUMMERS GYRO-SCOPE CO. 60
Agency—Byron H. Brown & Staff

THERMO ELECTRIC CO 25
Agency—Fred Lange Associates, Inc.

TWIGG INDUSTRIES, INC. 51
Agency—Gregory House, Inc.

VAN DUSEN AIRCRAFT SUPPLIES 60
Agency—Davis-Parsons, Inc.

VOI-SHAN MFG. CO., INC. 53
Agency—Anderson-McConnell Adv. Agency

WARNER DIV. DETROIT HARVESTER CO. 55
Agency—Clark & Roberts, Inc.

WESTINGHOUSE ELECTRIC CORP. 40, 41
Agency—Fuller & Smith & Ross, Inc.

SEARCHLIGHT SECTION

(Classified Advertising)

H. E. Hilty, Mgr.

EMPLOYMENT
Positions Vacant 69-73
Selling Opportunities Offered 73
Positions Wanted 73
Selling Opportunities Wanted 73
Employment Agencies 73

PLANES—EQUIPMENT
(Used or Surplus New)
For Sale 73-75

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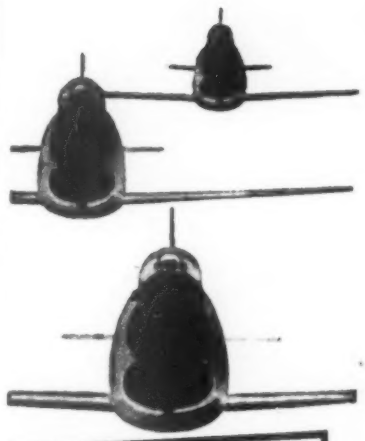

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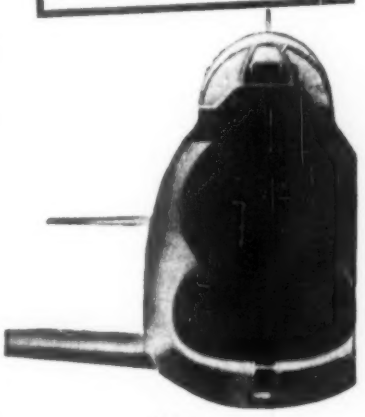

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EDITORIAL

TWA's Revitalized Management

"What top airline executive has done the outstanding job for his company in the past few years?" we have been asking our friends in air transportation and finance over the past 60 days.

"Ralph Damon" has been the most frequent answer, by far.

Ralph S. Damon

Which reminds you that everywhere you go on the Trans World Airlines system it seems President Damon has either just visited or is expected imminently, and apparently every TWA employe knows him and is proud of it. His New York office says he traveled a little over 150,000 mi. last year and will equal or exceed that figure in 1953.

TWA has gone through a revolution since Ralph S. Damon was elected president Jan. 25, 1949.

At that time the company was facing serious financial problems. For three consecutive years it had chalked up deficits, with a cumulative net loss of nearly $19 million for the period.

Morale was low, and everywhere in the industry you heard it questioned whether TWA could survive.

Now, more than four years later, the modest Damon could—but won't—point out an imposing record of accomplishments that demonstrate the substantial recovery his administration has achieved. There is a marked improvement in operations and organization, and a healthy morale is evident everywhere. And you recall suddenly that it was the same Damon who was called in and put Republic Aviation Corp. on its financial feet after it was taken over from its original management.

The Damon record at TWA can be demonstrated in cold, but very meaningful, statistics.

For example:

For the four years ended Dec. 31, 1952, the company reported cumulative net income totaling $26.9 million or better. While earnings provided the bulk of funds for the property buildup, considerable new money was brought into the company by various financing operations.

From February 1949 through November 1952, in three separate stock flotations, a total of about $15 million was added to TWA's equity funds. This excludes an improvement in the capital structure resulting from conversions of a $10.3-million subordinated note issue into common stock in August 1948.

In fairness, however, it should be noted that working capital balances were reduced from $9.2 million at the 1948 yearend to $3.9 million at Dec. 31, 1952, thus providing some $5.3 million toward capital expenditures.

The funds generated by these various means were largely applied to augment TWA's properties, primarily its aircraft fleet.

At the end of 1948, total property and equipment was shown at a net valuation of $45.9 million, with aircraft consisting of 33 Constellations, 12 DC-4s, 64 DC-3s and five old Boeing Stratoliners.

Four years later this same property account more than doubled to $92.5 million with a decided improvement in the aircraft fleet—comprising 68 Constellations, 10 Super Constellations, 40 Model 4-0-4s, and 12 Model 2-0-2As.

In the process, a major transition has also taken place in the company's capital structure. At Dec. 31, 1948, total debt amounted to $54.1 million, against a revised equity position of $10.2 million, or a debt ratio of 5.4 to 1—described in financial circles as "an extremely unhealthy situation."

By Mar. 31, 1953, while debt totaled $56.9 million, equity was bolstered to $50.3 million, making a debt ratio of almost 1 to 1, a vastly improved situation.

TWA's financial recovery is considered by Wall Street observers as even more remarkable in the face of the heavy debt capitalization thrust upon it by an insurance company in a 1946 financing operation. This, according to financial circles, created a disjointed, heavy debt structure with a thin equity position which plagued the company during its difficult years and shackled its subsequent equipment acquisition programs.

For example, Wall Street people point out that TWA has had to create debt senior to that held by the insurance company. Various chattel mortgages were required to finance its postwar re-equipment program. TWA is the only carrier in its category (the "Big Four" and Pan American) which has debt of the chattel mortgage variety.

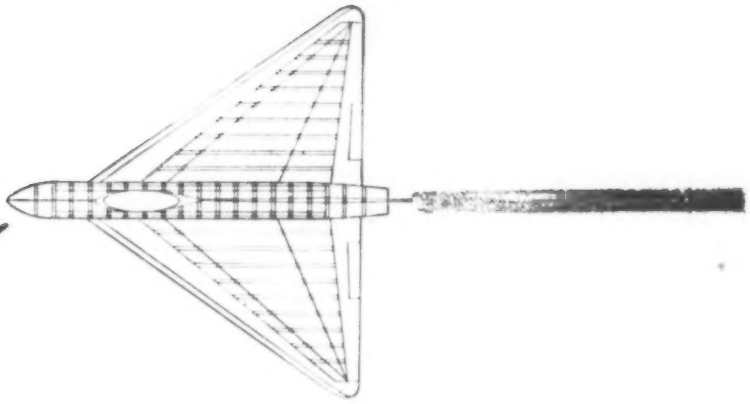
Actually, a burden has been placed on the company as a result of this past financing pursued by the insurance firm. The scale of debt maturities for the next few years is heavy and is covered by only a slight margin in projected cash throwoffs. This means that any additional equipment expansion must be provided through new financing and from earnings, and it would not surprise the financial fraternity if—with debt maturities in 1955 and 1956—a refinancing operation may be considered.

There is no doubt expressed, however, as to the ability of the Damon management to cope with its financial and other operations problems.

TWA is aggressive and has shown a definite willingness to assume calculated risks to broaden its markets—an attitude that is not discernible often in the major companies in the air transport industry. In becoming the largest operator of aircoach in the United States, TWA has, for example, demonstrated it has the ability to assume leadership in a highly competitive endeavor.

TWA's revitalized management under Ralph Damon represents an outstanding record of achievement.

—Robert H. Wood



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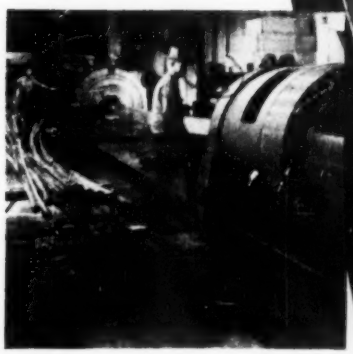

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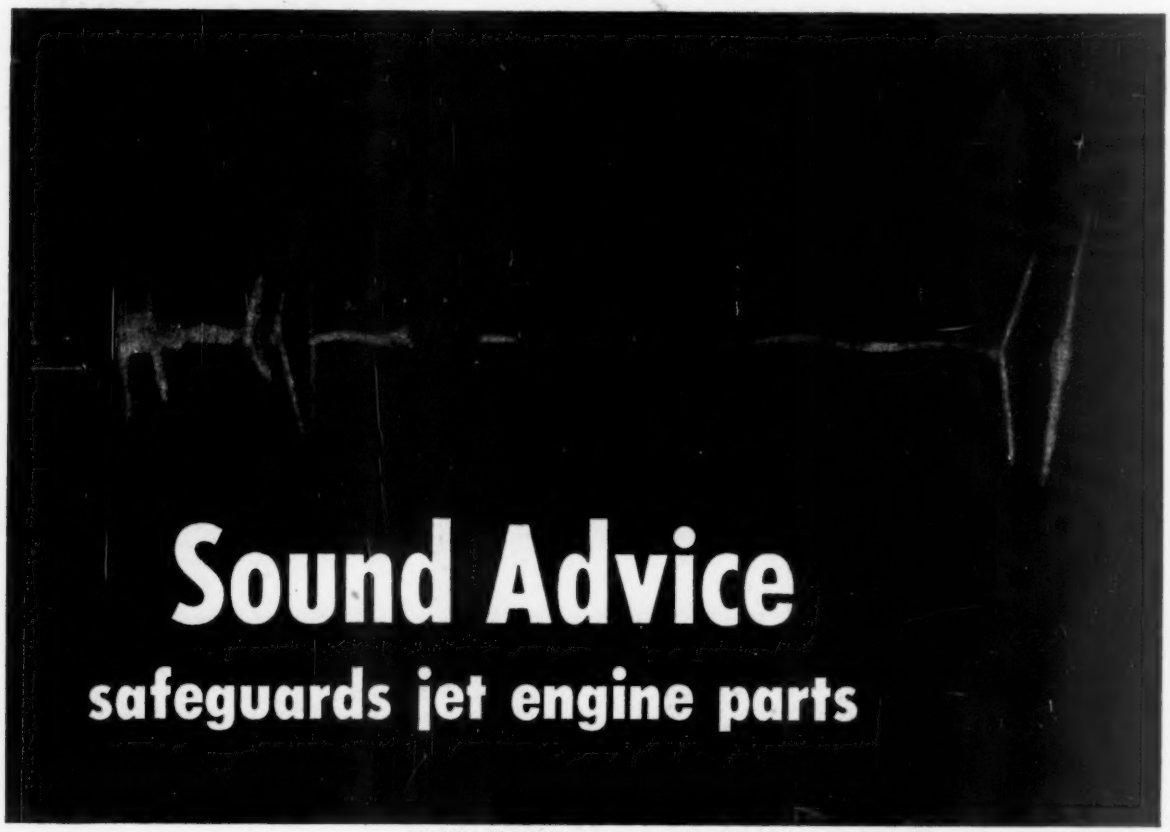

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